

Engineer Force Structure within the HBCT

**A Monograph
by
MAJ Don A. Nestor Jr.
United States Army**



**School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas**

AY 2008

REPORT DOCUMENTATION PAGE				<i>Form Approved</i> OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 14-04-2009		2. REPORT TYPE Monograph		3. DATES COVERED (From - To) July 2008-May 2009	
4. TITLE AND SUBTITLE Engineer Force Structure within the HBCT				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) MAJ Don A. Nestor Jr.				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Advanced Military Studies Program 250 Gibbon Ave Fort Leavenworth, KS 66027-213				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Command and General Staff College				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <p>The Army constructed the HBCT, one of the Army's primary tactical warfighting systems, for optimization in open and mixed terrain against conventional and irregular threats; however its embedded engineer forces have been reduced from a battalion to a single company. One engineer company simply does not provide the capabilities required for the HBCT to execute full spectrum operations. Systems theory and systemic perspectives provide valuable insight into the interrelationship of the HBCT's embedded units. If one of the interrelated variables is unable to perform its battlefield functions then the HBCT is also unable to perform its battlefield functions. The HBCT's reliance on external engineer forces has created several issues and areas of concern. Operations Desert Shield, Desert Storm, and Iraqi Freedom provide valuable insight into the importance of embedding engineer capabilities in order to conduct combat operations. Interviews from senior engineer commanders further highlight the Engineer Regiment's concerns with the modular BCT force structure. Recommendations provided include: 1) reestablishing the HBCT's engineer battalion, 2) reestablishing the HBCT engineer battalion command structure, and/or 3) establishing two HBCT engineer companies. These recommendations help improve the HBCT's embedded engineer capabilities and transform the HBCT into the Army's primary tactical warfighting system that is optimized for high intensity operations in open and mixed terrain against conventional and irregular threats.</p>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UNLIMITED	18. NUMBER OF PAGES 61	19a. NAME OF RESPONSIBLE PERSON Stefan J. Banach, COL, U.S. Army
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED			19b. TELEPHONE NUMBER (include area code) 913-758-3302

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

MAJ Don A. Nestor Jr.

Title of Monograph: Engineer Force Structure within the HBCT

This monograph was defended by the degree candidate on 17-March-2009 and approved by the monograph director and reader named below.

Approved by:

_____	Monograph Director
Jacob W. Kipp, Ph.D.	

_____	Monograph Reader
Michael J. Lee, Col, USMC	

_____	Director, School of Advanced Military Studies
Stefan J. Banach, COL, IN	

_____	Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.	

Abstract

ENGINEER FORCE STRUCTURE WITHIN THE HBCT by MAJ Don A. Nestor, United States Army, 61 pages.

The purpose of this monograph is to analyze the Heavy Brigade Combat Team's (HBCT) engineer force structure to answer the question: Does the HBCT have the necessary embedded engineer capabilities to conduct full spectrum operations, rapidly transitioning between stability and major combat operations. Operation Iraqi Freedom and the Hezbollah – Israeli Conflict of 2006 illustrate the vast array of threats that the U.S. military faces in executing the Global War on Terror. These threats require the Army's primary tactical warfighting systems, the brigade combat teams (BCTs), to operate across the full spectrum of conflict. The Army constructed the HBCT for optimization in open and mixed terrain against conventional and irregular threats; however its embedded engineer forces have been reduced from a battalion to a single company. One engineer company does not provide the capabilities required for the HBCT to execute full spectrum operations; consequently the HBCT must rely on engineer augmentation from the engineer force pool to execute specific operations. Systems theory and systemic perspectives provide valuable insight into the interrelationship of the HBCT's embedded units. The HBCT is greater than the sum of its individual parts. Subsequently, if one of the interrelated variables is unable to perform its battlefield functions then the HBCT is also unable to perform its battlefield functions. Operations Desert Shield, Desert Storm, and Iraqi Freedom provide valuable insight into the importance of embedding engineer capabilities in order to conduct combat operations, particularly major combat operations. Interviews from senior engineer commanders further highlight the Engineer Regiment's concerns with the modular BCT force structure. The HBCT's reliance on external engineer forces has created several issues and areas of concern. These issues include the contradictions to systemic thinking and perspectives, reduction in HBCT engineer capabilities, availability and integration of engineer augmentees, the command and control of engineer operations, and engineer specific training shortfalls. Recommendations provided include: 1) reestablishing the HBCT's engineer battalion, 2) reestablishing the HBCT engineer battalion command structure, and/or 3) establishing two HBCT engineer companies. These recommendations help improve the HBCT's embedded engineer capabilities and transform the HBCT into the Army's primary tactical warfighting system that is optimized for high intensity operations in open and mixed terrain against conventional and irregular threats.

TABLE OF CONTENTS

Introduction	1
Literature Review	4
Full Spectrum Operations.....	9
The Operating Environment – The Groundwork for Army Transformation.....	10
The Current & Future Threats	11
U.S. Army Transformation.....	13
The 2006 Hezbollah – Israeli Conflict	14
Background.....	15
Lessons Learned ~ Implications for U.S. Armed Forces.....	17
The Modular BCT – the U.S. Army’s Primary Tactical Warfighting System	19
The Modular HBCT	20
The Modular Engineer Force.....	22
Engineer Force Concept & Mission Requirements	23
HBCT Engineer Force Structure ~ the “Foundation Force”.....	25
Engineer Force Structure in Echelons above the BCT ~ the “Force Pool”	27
Engineer Transformation Issues / Areas of Concern	30
Application of Systems Perspectives and Systemic Thinking.....	31
Reduction in the HBCT’s Engineer Forces & Capabilities	34
Availability & Integration of Engineer Augmentees.....	38
Command & Control of Engineer Operations	42
Engineer Training Shortfalls	44
Conclusions	47
Recommendations	47
Reestablishing the Combat Engineer Battalion	48
Reestablishing the Engineer Battalion Command Structure	48
Establishing Two Engineer Companies.....	49
Areas for Improvement / Further Research	49
APPENDIX A – Full Spectrum Operations	52
APPENDIX B – Modular HBCT – Generation I	53
APPENDIX C – Modular Combined Arms Battalion (HBCT) – Generation I	54
APPENDIX D – Modular HBCT – Generation II.....	55
APPENDIX E – Maneuver Enhancement Brigade	56
APPENDIX F – Pre-Modularity Divisional Combat Engineer Battalion	57
BIBLIOGRAPHY	58
Books.....	58
Periodicals	58
Government Documents and Publications	59
Other	60

Introduction

“Relevant, Ready, Responsive, and Reliable”¹, these four powerful words form the backbone of the Engineer Regiment’s pursuit for excellence, in this case a pursuit for excellence that centers on serving the U.S. Army, the U.S. military, and the nation. The Engineer Regiment’s transformation has focused on restructuring engineer forces and capabilities and redesigning its concept of support in order to best serve the nation. Colonel Robert Tipton, the Commandant of the U.S. Army Engineer School, highlights the challenges and concerns transformation has presented in his December 2008 monthly update to the Engineer Regiment. “While the Army wrestles with new force structure challenges, it was clear by year’s end that the senior leadership of the Army is more concerned than ever about the future of our regiment and how engineer intensive full spectrum operations actually are.”² This monograph analyzes the engineer force structure and capabilities embedded in one of the Army’s three primary tactical warfighting systems, the Heavy Brigade Combat Team (HBCT). It addresses the HBCT’s ability to execute full spectrum operations, rapidly and continually transitioning between stability and major combat operations.

The 2008 National Defense Strategy highlights the importance of military forces’ ability to conduct full spectrum operations in today’s complex adaptive operating environment. It is no secret that the events of 9/11 have created profound and lasting impacts on the United States in general and the military specifically. The threats posed to the national interests of the United States may be from other state actors, non-state actors, or self empowered individuals and

¹ U.S. Army Corps of Engineers Los Angeles District Public Affairs Office, “U.S. Army Corps of Engineers Los Angeles District Homepage”, USACE – Los Angeles District, <http://www.spl.usace.army.mil/cms/index.php> (accessed February 03, 2009).

² COL Robert Tipton, “The US Army Engineer School (USAES) provides the following information:,” Message to the Regiment #61, <http://www.hqda.army.mil/daen/engineer/MESSAGE%20TO%20THE%20REGIMENT%2061.pdf> (accessed 12 JAN 09).

organizations. The ability to operate across the full spectrum of conflict has always been of paramount importance; the 21st Century's complex operating environments have required the United States Army to transform its force structure to meet these challenging demands.³

Although improving the U.S. Armed Forces' proficiency in irregular warfare is the Defense Department's top priority, the United States does not have the luxury of preparing exclusively for such challenges. Even though the likelihood of interstate conflict has declined in recent years, we ignore it at our peril.⁴

The current Army lexicon focuses on counterinsurgency (COIN) operations, but as the National Defense Strategy highlights the United States cannot ignore the possibility of interstate conflict; to ignore this potential threat could be catastrophic. This warning leads one to ask whether transformation has affected the Army's ability to conduct full spectrum operations. Operations Iraqi Freedom and Enduring Freedom have seen a modular force focused primarily on stability and COIN operations. Are U.S. Army forces still structured properly to conduct major combat operations similar to Operation Desert Storm or the invasion of Iraq during Operation Iraqi Freedom?

There is much debate surrounding Army transformation. The focus of much of this dialogue centers on emerging engineer doctrine, engineer capabilities, and the brigade combat teams' (BCTs) reduced embedded engineer force. The lack of senior engineer leadership and the BCT's need for mobility support is also gaining much attention.⁵ This monograph focuses specifically on looking at the capabilities embedded in the Heavy Brigade Combat Team. The monograph will place particular emphasis on analyzing the impacts of transformation within the HBCT's embedded engineer forces. Systems perspective and its relevant theories provide valuable insight in analyzing the HBCT as a "System of Systems." Accordingly, the HBCT is a

³ U.S. Department of Defense, *The National Defense Strategy* (Washington D.C.: U.S. Government Publishing Office, 2008), 13.

⁴ Ibid., 13.

⁵ LTC Edward R. Lefler and Les R. Hell, "Engineer Doctrine Update." *Engineer: The Professional Bulletin of Army Engineers* (January-March 2006): 29.

tactical warfighting system that is greater than the sum of its individual parts (its individual combat units and warfighting functions).

Army transformation has reduced the HBCT's embedded engineer force from a battalion sized element (three combat engineer sapper companies and an HHC consisting of approximately 415 Soldiers) to its current configuration of one combat engineer sapper company (151 Soldiers). This reduced force structure creates areas of concern and challenges for both the HBCT and the engineer forces. Five major challenges comprise these areas of concern: 1) the application of systems perspectives and systemic thinking; 2) the reduction of the HBCT's engineer forces and capabilities; 3) the availability and integration of engineer augmentation forces; 4) the command and control of engineer operations; and 5) the engineer training shortfalls. The HBCT's current modular force structure does not have the necessary organic engineer assets required to rapidly and continuously transition between stability and major combat operations. One engineer company simply does not provide the engineer capabilities and senior leadership required for one of the Army's primary tactical warfighting systems.

The third generation HBCT structure needs to address the lack of embedded engineer capabilities. HBCTs must have the embedded capabilities to conduct mobility, countermobility, survivability, and limited general engineering. There are three potential recommendations for improving the HBCT's force structure:

- 1) Reestablishing the combat engineer battalion
- 2) Reestablishing the engineer battalion command structure
- 3) Establishing two engineer companies

Reestablishing the HBCT's engineer battalion is the most effective way to support full spectrum operations from both a command and control and capabilities perspective; however, establishing two engineer companies begins to address the deficiency in engineer capabilities embedded in the HBCT.

Literature Review

Many writings surround the topic on Army transformation and the issue of engineer support embedded in the Army's primary tactical warfighting system, the BCT. Understanding that there are three distinct variations on the BCT, this monograph will focus primarily on the HBCT. The literature review will help highlight some of the recent positions and recommendations for the Engineer Regiment as transformation continues to change the face of the Army. The literature used to inform my writings are divided into six major categories. These six categories comprise: 1) military doctrine and government documents describing Army transformation and defining the operating environment; 2) writings pertaining to the Hezbollah-Israel conflict in 2006; 3) academic books and writings discussing systems theory; 4) after action reviews from Operation Desert Shield and Desert Storm; 5) monographs, strategic studies, and professional writings discussing Army transformation specifically pertaining to the engineer force; and 6) interviews and transcripts from Army leaders during Operation Iraqi Freedom (OIF). This section will describe the importance of these writings in informing the monograph's discussions and analysis.

Military doctrine and government documents have been informative in describing the current and future operating environments, environments that have created the conditions requiring the Army to transform its forces. These sources explain the potential threats to the United States, the roles and capabilities of the U.S. Army's primary tactical warfighting systems, and the force transformation required to accomplish the mission. Military doctrine was also instrumental in describing the modular engineer force, providing insight into the roles and responsibilities for both the BCT engineer force structure ("foundation force") and the engineer force structure at echelons above brigade ("force pool").

The Hezbollah – Israeli Conflict of 2006 highlights the glaring issues that can arise when a far technologically superior military force focusing predominantly on stability and COIN operations while neglecting high intensity conflict. The Israeli Defense Force's (IDF) focus and

continual execution of COIN and stability operations decreased their combined arms proficiency and the IDF was subsequently unprepared to conduct high intensity operations.⁶ The operating environment and military focus are reminiscent of circumstances in the Afghanistan and Iraq theaters of operations and prove to be important to the U.S. Army as it executes the Global War on Terror (GWOT). Matt Matthews' Occasional Paper 26, *We Were Caught Unprepared: The 2006 Hezbollah – Israeli War*, and Russell Glenn's National Defense Research Institute (RAND) report, *All Glory is Fleeting: Insights from the Second Lebanon War* are the two primary sources used to study the Israeli Defense Forces' lessons learned.

Matthews' work focuses on gaining valuable insight from primary and comprehensive material and clarifying facts through interviews with Israeli political leaders, IDF military leaders, soldiers, and war stricken families.⁷ Glenn similarly conducts numerous interviews with former and current members of the IDF and references available documents and literature to develop the findings in his report.⁸ Both works aim to identify the conflict's concerns and provide insight into the relevance of lessons learned for future operations.⁹ Both authors' findings highlight Hezbollah as an enemy that is capable of exploiting the weaknesses of a far superior conventional military force. The lessons learned are very relevant to a U.S. military that has been conducting continuous combat operations for over six years.¹⁰ There is no doubt that the U.S. Army is a far superior conventional military force than its enemies in either Iraq or Afghanistan. However, the HBCT's reduced engineer forces and capabilities highlight glaring weaknesses for the U.S.

⁶ Matt M. Matthews, *We Were Caught Unprepared: The 2006 Hezbollah-Israeli War* (Fort Leavenworth: Combat Studies Institute Press, 2008), iii, 2; Russell W. Glenn, *All Glory is Fleeting: Insights from the Second Lebanon War* (Suffolk: National Defense Research Institute (RAND), 2008), iii, 52.

⁷ Matthews, 81.

⁸ Glenn, iii.

⁹ Glenn, iii; Matthews, iii, 90.

¹⁰ Ibid.

Army, similar to the IDF, in its ability to train, integrate, and build cohesive units capable of conducting high intensity combined arms operations. The Hezbollah – Israeli conflict highlights the importance for a military to be postured and prepared to rapidly and continuously transition across the full spectrum of conflict.

The writings of Ludwig von Bertalanffy, Peter Senge, and Dietrich Dorner are invaluable in providing the academic underpinnings of systems theory. Systems theory and perspectives establish the HBCT as one of the Army's three primary tactical warfighting systems, the Army's "System of Systems." Bertalanffy's general system theory is an exploration into the "wholeness" of a system; a system's whole is larger than the sum of its individual parts.¹¹ This "wholeness" relates directly to the HBCT whose effectiveness is far greater as a system of interrelated parts (its embedded units) working together than it is with its parts working independently. The crux of the argument is that the HBCT's engineer force structure is an integral part of the system; by minimizing the engineer force structure the combat effectiveness of the HBCT is diminished, particularly during major combat operations. Peter Senge further emphasizes a more holistic understanding of organizational life. His writing focuses on understanding how we think and how we interact. Senge addresses systems theory as an important process for understanding the whole, understanding the interrelationships between a system's parts.¹² Dietrich Dorner's writings discuss the difficulty and problematic nature of decision making, especially in complex adaptive systems.¹³ This logic of failure provides an important perspective in the Army's ability to properly assess Army transformation and adjust the modular force as experiences dictate. Dorner's writing aims at improving decision making, which is aligned with the monograph's aim of improving the HBCT's engineer capabilities and force structure.

¹¹ Ludwig von Bertalanffy, *General System Theory* (New York: George Braziller, Inc., 1968), xx, 34-37.

¹² Peter M. Senge, *The Fifth Discipline* (New York: Doubleday, 1990), xiv, 12.

¹³ Dietrich Dorner, *The Logic of Failure* (New York: Metropolitan Books, 1996), ii, 10.

Recognizing that this is not the first monograph written on the subject of the Army's new modular engineer force structure it is important to understand where this monograph fits into the current debate. The interviews and transcripts from Army leaders during OIF as well as monographs, strategic studies and professional writings provide the largest impact on the monograph's body of knowledge. The interviews conducted with senior leaders represent important views attained through operational experience during OIF and provide real world experiences in dealing with the new modular engineer force structure. The senior leaders' positions on the state of the Engineer Regiment present an important voice and sounding board to the ongoing dialogue. The body of literature presented in these monographs, strategic studies and professional writings provide important, convergent and divergent views on the current engineer force structure.

While many of the interviews and writings discuss engineer force structure within the BCTs in general, the comments from the field commanders are a glaring sign that the HBCT's engineer force structure needs to be relooked. COL Don Young's, COL Lou Marich's, and LTC James Raymer's insights incorporate the three main interviews referenced during research. COL Don Young served as the 1st Armored Division's engineer brigade commander in Iraq from May – July 2003. The pertinent portions of his interview focus on modularity, the negative impacts on the engineer force structure, and relooking the old engineer force structure that resulted from operational experience in Operation Desert Storm.¹⁴ COL Marich also commanded the 1st Armored Division's engineer brigade from July 2003 – July 2004 during OIF. His interview focuses on experiences with the BCTs' integration of augmenting units, the need for more robust

¹⁴ COL Don C. Young, interview by Dennis Van Wey, April 10, 2006, transcript, Operational Leadership Experiences, Combined Arms Research Library Digital Library, <http://cgsc.leavenworth.army.mil/carl/contentdm/home.htm>.

BCTs, and the flexibility that combat engineer battalions provide to BCTs.¹⁵ LTC Raymer was an operations officer for the 44th Engineer Battalion and deployed with 2nd Brigade, 2nd Infantry Division to Iraq from August 2004 – August 2005. His interview addresses engineer specific missions conducted and the impact of modularity and Army transformation on engineer units.¹⁶ These interviews are critical to the ongoing debate on engineer modularity and are instrumental in informing this monograph's research.

COL Tom O'Hara's and MAJ Mike Derosier's monographs, written prior to the second generation HBCT force structure, address the deficiency between BCT engineer requirements and embedded capabilities. COL O'Hara attempts to identify gaps in the current modular engineer force structure by reviewing the operating environment, the BCT organization and the supporting engineer transformation concept. COL O'Hara concludes that the BCT's engineer force structure is insufficient and recommends that a multifunctional engineer battalion be embedded in the current BCT organization.¹⁷ MAJ Derosier conducted a historical study of engineer transformation, defined transformation, and examined engineer options for the operating environment. His recommendations center on embedding an engineer battalion within the BCTs that is capable of conducting full spectrum engineer operations to include combat, bridging, geospatial, and construction capabilities. At a minimum, he opines that the BCTs need to double the size of their embedded engineer companies.¹⁸

¹⁵ COL Lou Marich, interview by Dennis Van Wey, April 10, 2006, transcript, transcript, Operational Leadership Experiences, Combined Arms Research Library Digital Library, <http://cgsc.leavenworth.army.mil/carl/contentdm/home.htm>.

¹⁶ LTC James Raymer, interview by John McCool, February 24, 2006, transcript, transcript, Operational Leadership Experiences, Combined Arms Research Library Digital Library, <http://cgsc.leavenworth.army.mil/carl/contentdm/home.htm>.

¹⁷ COL Thomas O'Hara, "Engineer Support to Future Full-Spectrum Operations" (Strategy Research Project, Carlisle Barracks, 2008), abstract, 15, 27.

¹⁸ MAJ Michael C. Derosier, "Assessing Engineer Transformational Concepts" (Monograph, School of Advanced Military Studies, 2005), iii, 34, 52.

MAJ James Schultze takes a different approach to the current engineer force structure stating that the Army's current BCT has huge limitations with its embedded construction capabilities. These limitations have greatly reduced the BCT's ability to conduct full spectrum operations, particularly those operations on the low intensity end of the spectrum. He further states that the demands of the operating environment have created a need for more engineer capabilities across the spectrum of conflict. MAJ Schultze recommends that in today's operating environment the maneuver enhancement BCT (sic.) has the potential to be the most effective BCT organization.¹⁹ COL Jeffrey Eckstein concludes that while engineer force capabilities are not completely adequate, particularly at the company and battalion level, that the engineer modular force structure is acceptable.²⁰

COL Roger Wilson discusses the Army's shortfall in trained personnel that are able to effectively conduct and manage stability, security, transition, and reconstruction (SSTR) operations. He asserts that reconstruction poses the most glaring deficiency in the Army's current modular force structure. His recommendations include ensuring appropriate engineer training and resources are present in both the active duty and reserve component in order for the military to effectively conduct SSTR operations.²¹ These writings highlight the different perspectives and challenges resulting from Army transformation. The BCT's lack of embedded engineer capabilities summarizes the central theme to the ongoing debate.

Full Spectrum Operations

The primary mission of the Army is to fight and win the Nation's wars. Conducting offensive and defensive operations has long been the Army's core capability. However, the recent experience of operations in the Balkans, Iraq, and

¹⁹ MAJ James M. Schultze, "Breaching the Phalanx: Developing a More Engineer-Centric Modular BCT" (Monograph, School of Advanced Military Studies, 2007), 3, 31, 40.

²⁰ COL Jeffrey R. Eckstein, "Modular Engineer Structure in Divisions." *Engineer: The Professional Bulletin of Army Engineers* (January-March 2008): 61-63.

²¹ COL Roger A. Wilson Jr., "Campaign Quality Gap: Developing Strategic Engineering Competency" (Strategy Research Project, Carlisle Barracks, 2007), 18-20.

Afghanistan, coupled with today's operational environments, clearly indicates that the future will be an era of persistent conflict – one that will engage Army forces around the world to accomplish the Nation's objectives. This all points to the fact that the Army must adopt a new mindset that recognizes the requirement to successfully conduct operations across the spectrum of conflict, anytime, anywhere.²²

Army doctrine embeds full spectrum operations in its lexicon to describe the type of operations that its combat units will be conducting regardless of the operating environment. Doctrine further states that all operations are full spectrum operations.²³ Full spectrum operations encompass the execution of conventional and irregular as well as lethal and non-lethal operations. It is an ascending and descending scale of conflict ranging from war to stable peace.²⁴ The scale requires continuous and simultaneous combinations of offensive, defensive, and stability or civil support tasks across an operating environment. The Army must be prepared to defeat its adversaries by integrating its capabilities across the entire spectrum.²⁵ The ability to rapidly and continuously transition throughout the spectrum of conflict cannot be understated; it requires units that are versatile, flexible, and responsive.

The Operating Environment – The Groundwork for Army Transformation

An operational environment is a composite of the conditions, circumstances, and influences which affect the employment of capabilities and bear on the decisions of the commander. It encompasses physical areas and factors (of the air, land, maritime, and space domains) and the information environment.²⁶

Military doctrine defines an operational environment by analyzing eleven critical variables. These variables are the physical environment, nature and stability of the state, military

²² U.S. Army, "FM 7-0 Training For Full Spectrum Operations (December 2008)," U.S. Army Combined Arms Center, <http://usacac.army.mil/cac2.FM70.asp> (accessed December 17, 2008), 1-1.

²³ Ibid., 1-3.

²⁴ Appendix A (Full Spectrum Operations) to this monograph illustrates the ascending and descending scale of full spectrum operations. This figure is taken from *FM 7-0 Training For Full Spectrum Operations (December 2008)*.

²⁵ U.S. Department of Defense, *National Defense Strategy*, 13.

²⁶ U.S. Department of Defense, *JP 3-0 Operations* (Washington D.C.: U.S. Government Printing Office, 2008), II-19-20.

capabilities, technology, information, external organizations, sociological demographics, regional and global relationships, national will, time, and economics. Each operational environment will be described differently based on the importance of these variables and their interrelationships.²⁷ The landscape of cultural, physical, and demographic factors further complicates the operational environment presenting a potentially complex adaptive environment. An environment where cultural and religious differences, humanitarian crises, conflict and unrest can be interwoven and dramatically affect military operations.²⁸ Today's complex operating environments have necessitated the Army's transformation in order to defeat the challenges inherent in its multi-faceted landscape and diverse threats.

The Current & Future Threats

General George Casey, during his 2008 address to the Association of the U.S. Army, discusses the diverse range of threats and capabilities that the United States faces in the 21st Century.²⁹

I believe we should expect to deal with a range of diverse actors; frequent non-state actors, sometimes operating covertly or as proxies for states.... We should expect to deal with what I call hybrid threats – diverse combinations of irregular, terrorist, and criminal capabilities – that will be resistant to attack by conventional capabilities.... I believe conflicts will become more unpredictable, arising suddenly, expanding rapidly, and continuing for uncertain durations in unanticipated, and in austere locations.³⁰

These complex and adaptive threats take the form of traditional, irregular, catastrophic, and disruptive challenges that jeopardize the United States' national security. Traditional challenges

²⁷ U.S. Army, *FM 3-34 (FM 5-100) Engineer Operations* (Washington D.C.: U.S. Government Printing Office, 2004), 2-2.

²⁸ U.S. Army, *FM 3-0 Operations*, 1-4.

²⁹ GEN George W. Casey Jr., Chief of Staff of the Army Address, annual meeting of AUSA – Association of the United States Army, October 7, 2008, transcript, http://www.ausa.org/news/latestnews/NewsArchive_2008/Documents/2008AnnualMeetingCaseyTranscript.pdf (accessed November 4, 2008).

³⁰ Ibid.

are posed by other state actors; actors that employ unconventional measures to counter the United States' technological and military advantages characterize irregular challenges. Catastrophic challenges are those posed by weapons of mass destruction and disruptive challenges exist when actors develop technological devices that can minimize the United States' advantages in specific operational areas.³¹ These challenges have been highlighted in recent years with the attacks of September 11th, the battlefields of Iraq and Afghanistan, as well as other areas across the globe.

The operating environments of Iraq and Afghanistan present battlefields filled with irregular warfare. These challenges have shifted the Army's mindset from focusing on high intensity conflict to counterinsurgency and stability operations.³² The need to meet and defeat these challenges is indisputable. The National Defense Strategy describes the threat posed by violent extremists and non-state actors as a threat that will exist for the foreseeable future creating a global struggle. Irregular challenges will be the norm rather than the exception, but caution should also be given to the rise of traditional military powers.³³ The current HBCT force structure has proven it is capable of conducting irregular operations; however, can HBCTs effectively execute high intensity conflict against a traditional state actor?

The future threat posed by traditional powers / state actors or the evolution of non-state actors into formidable military forces, although less likely in the current global environment, must never be overlooked or forgotten. "We must also consider the possibility of challenges by more powerful states. Some may actively seek to counter the United States in some or all domains of traditional warfare or to gain an advantage by developing capabilities that offset our

³¹ U.S. Department of Defense, *The National Military Strategy of the United States of America* (Washington D.C.: U.S. Government Printing Office, 2004), 3-4.

³² U.S. Army, "2006 Army Modernization Plan: Building, Equipping & Supporting the Modular Force" (Army Modernization Plan, Washington D.C., 2006), 12.

³³ U.S. Department of Defense, *National Defense Strategy*, 2.

own.”³⁴ The Hezbollah – Israeli conflict of 2006 highlights the risks inherent when placing too much emphasis on the demands of irregular warfare while neglecting to maintain a combat force capable of effectively executing high intensity conflict. The United States Army must caution itself to posture a force that is capable of conducting major combat operations if traditional challenges surface or evolve with the reconstitution of a non-state actor opponent.

U.S. Army Transformation

The Army has transformed its force structure to meet the challenging demands of full spectrum operations as well as the diverse and complex global operating environments. Army transformation’s goal is to restructure the operating force in order to achieve military dominance.³⁵ General Casey describes versatile forces as the key ingredient in being able to respond to current and future threats as they present themselves. He further states that these versatile forces are instrumental in accomplishing tasks while still transitioning across the full spectrum of conflict.³⁶ Versatile units must be able to simultaneously conduct offensive operations in one area, defensive operations in a second area, and stability tasks in yet another area. The U.S. military can expect that its future operating environments will require full spectrum operations.

Army transformation establishes the brigade combat teams as the primary warfighting systems to execute tactical operations across the full spectrum of conflict.³⁷ The HBCT’s ability to rapidly and continuously transition from stability to high intensity operations and conventional to unconventional warfare will be the true measure of its successes or shortcomings.

“Transformation is a process that shapes the changing nature of military competition and

³⁴ Ibid., 3.

³⁵ U.S. Department of Defense, *The National Military Strategy of the United States of America*, 3.

³⁶ GEN Casey, AUSA Address.

³⁷ U.S. Army, “2006 Army Modernization Plan,” 22.

cooperation through new combinations of concepts, capabilities, people and organizations.”³⁸

Army transformation is a balancing act shaping the force to be versatile and deployable as an expeditionary force while still maintaining its combat effectiveness. The Army’s goal is to increase the number of BCTs in the force while still maintaining or increasing the combat effectiveness of the old divisional force structure’s combined arms brigades.³⁹ The issue is whether transformation has developed according to its original intent. Does the HBCT’s current force structure have the engineer capabilities to conduct offensive, defensive and stability operations continuously and simultaneously?

The 2006 Hezbollah – Israeli Conflict

Israel is a country surrounded by enemies; its survival is dependent on its ability to maintain the best fighting force in the Middle East. Israel’s daily reality makes studying the outcome of this conflict even more powerful and alarming. Even with the outside world continually threatening its very survival, the Israeli military’s ability to conduct high intensity conflict atrophied over time as a result of conducting continuous stability and counter-insurgency operations. If this atrophy can happen to a country surrounded by its enemies then it can surely happen to the U.S. military as well. The intent for studying the Hezbollah⁴⁰ – Israeli conflict is to focus on the lessons learned by the far superior Israeli Defense Force (IDF) fighting a militarily inferior non-state actor, Hezbollah, and examine how the lessons apply to Army transformation in today’s operating environment.

³⁸ Ibid., 17.

³⁹ Ibid., 22.

⁴⁰ There are different spellings for the non-state actor Hezbollah. For the purposes of this monograph, unless a direct quote spells it otherwise, the common spelling used to identify the non-state actor is Hezbollah.

Background

Now, as I look at the conflicts that we're seeing around the world, I'm drawn to the Israeli-Hezbollah conflict in 2006, and I believe that conflict illustrates a number of these emerging characteristics. The conflict pitted Israel against a terrorist group and a non-state actor, Hezbollah, that was operating inside another state, Lebanon, and supported by yet another state, Iran. Hezbollah embedded itself in the population, employed modern civil technology and advanced military weaponry, which it combined with IEDs and other asymmetric techniques, and it basically denied Israeli forces their objectives.⁴¹

The recent Hezbollah – Israeli conflict began on July 12th, 2006 when two IDF vehicles struck an improvised explosive device (IED). Hezbollah forces subsequently ambushed the IDF vehicles using rocket propelled grenades and small arms fire. One of the IDF's quick reaction force tanks struck an IED and was destroyed while responding to the ambush. In total, Hezbollah forces killed eight IDF soldiers on the first day.⁴² The Hezbollah forces combined conventional and guerrilla warfare with terrorism and insurgency to offset and challenge the IDF's far superior military might. This hybrid⁴³ form of fighting thoroughly confused the IDF; the IDF were surprised at the Hezbollah fighters' level of proficiency and degree of capabilities, they were a force with conventional capabilities and a guerilla mentality. This enemy⁴⁴, which had fought the IDF since the 1982 invasion, was well trained, equipped, and led proving to be different than

⁴¹ GEN Casey, AUSA Address.

⁴² Jane's Intelligence Review, "Terrorism & Insurgency," Janes (November 1, 2006), <http://www8.janes.com/Search/documentView.do?docId=/content1/janesdata/m> (accessed July 31, 2008).

⁴³ GEN Casey, AUSA Address. GEN Casey discusses the hybrid threat in his 2008 AUSA address. "We should expect to deal with what I call hybrid threats – diverse combinations of irregular, terrorist, and criminal capabilities – that will be resistant to attack by conventional capabilities."; Mathews, 22. Matt Mathews describes the Hezbollah model of fighting in a similar fashion. "It could be argued that Hezbollah's "new model," which combined both guerilla and conventional methods, in many ways mirrored the approach adopted by the North Vietnamese and Viet Cong during their long war with the United States."

⁴⁴ Glenn, 8-9. There were two primary elements within the Hezbollah tactical forces. The full time guerilla forces comprised the first faction of the Hezbollah forces. These full-time guerilla fighters were very skilled, well trained and extremely motivated. They were predominantly split into 15-20 person units and were primarily responsible for missile, artillery and sniper attacks. The village guards, many veterans of the 1990 conflict with the IDF, formed the second faction of the Hezbollah tactical forces. These seasoned fighters were well armed, extremely familiar with the terrain, and best suited for interdicting and frustrating the IDF advance.

previous enemies. Hezbollah's ability to integrate direct and indirect weapons systems with mines and IEDs presented a formidable enemy that would require the IDF to conduct major combat operations with a force that had been focusing on stability and COIN operations.

This atrophy in major combat operations proficiency, specifically combined arms operations⁴⁵, would prove costly to the Israeli military which ended the conflict with Hezbollah forces undefeated and its military legacy as the dominant power in the region questioned. The IDF's armored bulldozer operations during and after the Al-Aqsa Intifada⁴⁶ demonstrate the military's focus on stability and COIN operations. The armored D9 bulldozers⁴⁷ were used extremely effective demolishing suspected enemy dwellings, clearing and opening routes for IDF forces, and rescuing trapped IDF vehicles. The IDF conducted countless bulldozer operations destroying buildings and homes while pursuing subversive elements.⁴⁸ The bulldozer's success

⁴⁵ Scribd, "Israeli Ground Forces," Scribd, <http://www.scribd.com/doc/12354901/Israeli-Ground-Forces> (accessed March 8, 2009). Israeli engineers, much like U.S. engineers, provide warfighting functions that are integral to combined arms operations. The IDF infantry brigades have an embedded combat engineer company and the Israeli Engineer Corps (IEC) units are generally task organizing with IDF maneuver units as the situation dictates. The IEC combat engineer units provide critical warfighting functions for the maneuver units; these warfighting functions include mobility, countermobility, survivability, counter-NBC, demolitions, sabotage, and special engineering. The mobility operations include breaching manmade and natural obstacles, disarming explosive devices, demolition operations, and clearing debris in order to enable freedom of maneuver. The combat engineer professions that perform a majority of these mobility functions include sappers, engineering vehicle operators, bulldozer operators, NBC disposal, explosive ordnance disposal (EOD) experts, demolition experts, fortification experts, and counter-tunnel experts. The IEC's bulldozer operations gained much acclaim during the 2000 al-Aqsa Intifada countering terrorist and greatly reducing IDF casualties.

⁴⁶ GlobalSecurity.org, "Al-Aqsa Intifada," John Pike, <http://www.globalsecurity.org/military/world/war/intifad2.htm> (accessed March 30, 2009). The Al-Aqsa Intifada began in September 2000 between Israeli forces and violent Palestinian organizations. The events of the Intifada required the IDF to conduct irregular warfare that persisted from September 2000 to the Hezbollah – Israeli Conflict of 2006.

⁴⁷ MathKnight & Zachy Evenor, "IDF Caterpillar D9 armored bulldozer," MathKnight, <http://www.geocities.com/israel1mathknight/D9bulldozer.htm> (accessed March 30, 2009). Author describes the D9 dozer as one of the best solutions the IDF has for countering terrorism. Article further describes the combat survivability of the bulldozer from IEDs, RPGs, landmines, and small arms fire. The article further describes the battlefield applications for the D9 dozer to include detonating IEDs and landmines, clearing terrain and obstacles, and opening routes for maneuver forces.

⁴⁸ Steve Niva, "A War Without Balance: Rachel Corrie, Nuha Sweiden and Israeli War Crimes," *CounterPunch* (March 15, 2003), <http://www.counterpunch.org/niva03172003.html> (accessed March 29, 2009). The article describes the IDF's destruction of over 150 Palestinian homes since June 2002. It further

during the Al-Aqsa Intifada elevated the IDF level of confidence and ability to conduct low intensity conflict and established the bulldozer as a critical component of COIN operations. The bulldozer solution to urban warfare provided a non-lethal solution to the IDF's counterinsurgency problem. However, this solution assumed the enemy of the future would resemble the enemy of the Intifada, an enemy with a limited ability to conduct conventional operations. The damage inflicted in just over a month reflects the IDF's focus on low intensity conflict and lack of preparation for Hezbollah's hybrid model of warfare. As a result of the 2006 conflict the Israeli Defense Forces suffered 119 casualties, 14 tanks destroyed, and an additional six tanks damaged.⁴⁹ The conflict concluded on August 14, 2006, with the passage of United Nations Security Council Resolution 1701[12].⁵⁰

Lessons Learned ~ Implications for U.S. Armed Forces

Why were the Israelis so unprepared for the conflict? The last time the IDF fought a conventional enemy was Lebanon's military in the early 1980s. In the years leading up to 2006, the IDF had become extremely proficient in its stability and COIN operations. This proficiency, coupled with a perceived lack of an immediate threat possessing a conventional capability increased the IDF's confidence creating a false sense of security. The Israeli government and military leaders shared a common belief that there would be very limited conventional warfare in

describes the IDF's armored operations within the Gaza Strip population centers and refugee camps that ravaged homes and destroyed built up areas while searching for subversive personnel.; End the Occupation: US Campaign to End the Israeli Occupation, "Investigate Caterpillar Bulldozer Violations of U.S. Law," End the Occupation, <http://www.endtheoccupation.org/article.php?id=251> (accessed March 29, 2009). This article expands on the destruction created by the Israeli bulldozer operations stating that since September 2000 over 12,000 Palestinian homes have been damaged in both the West Bank and Gaza Strip. It further emphasizes that between October 10th and 20th, 2003 over 130 Palestinian homes were destroyed.

⁴⁹ Glenn, 7, 12, 22-23, 51-52, 73; Mathews, iii, 16, 18, 22, 44, 51.

⁵⁰ Efraim Inbar, "How Israel Bungled the Second Lebanon War," *The Middle East Quarterly* (Summer 2007): 58.

the near future, especially from non-state actors like Hezbollah.⁵¹ The IDF subsequently planned for small skirmishes and irregular warfare, not the large scale conventional opposition that was encountered throughout the month long conflict. This focus and emphasis on one particular end of the spectrum of conflict came at the expense of the other end of the spectrum. The IDF neglected their basic tactical warfighting skills and combined arms proficiencies and were slow in recognizing and adjusting to the conventional capabilities of the enemy; they were unprepared for Hezbollah's hybrid model of warfare in July and August 2006.⁵² Israel had overwhelming military combat power, yet was unable to defeat its enemy. "The Second Lebanon War offers an example perhaps without recent historical precedent: a military conducting conventional combat operations for which it was not prepared due to its having too greatly focused on irregular conflict."⁵³

The United States can never overlook the enemy and their capabilities and must prepare its military most appropriately to conduct full spectrum operations. *FM 3-0 Operations* highlights the need for forces involved in long term stability and civil support operations to acquire intensive training in order to regain proficiency in offensive and defensive skills prior to

⁵¹ Glenn, 4-6. The IDF believed that Hezbollah capabilities would be similar to those encountered in 2000. The IDF was very surprised with the level of resistance from and the successes of the Hezbollah forces during the ground offensive in 2006. The Hezbollah forces had spent years training and preparing defensive positions in southern Lebanon's rugged terrain. The IDF was clearly not prepared for this threat. Israel used air power in its initial response to Hezbollah attacks and delayed the ground offensive. Once the ground offensive was initiated the IDF relied on its reserve forces for a major portion of the fighting. The IDF mobilized over 15,000 reservists in what was initially considered COIN operations. The reserve units did not possess the combined arms proficiencies required to combat the enemy they would be fighting.; Mathews, 49. Matt Mathews also discusses the impact of using IDF reserve units in the conflict. The IDF commanders were very hesitant to use reserve units during the conflict due to their poor discipline and lack of training. Mathews cites a reserve soldier's response to a reporter: "In the past six years I've only had a week's training.... For the last six years we were engaged in stupid policing missions in the West Bank.... Checkpoints, hunting stone-throwing Palestinian children, that kind of stuff. The result was that we were not ready to confront real fighters like Hezbollah."

⁵² Glenn, xii, 15, 20, 22, 24; Matthews, iii, 1, 28.

⁵³ Glenn, 72.

conducting major combat operations.⁵⁴ Recent U.S. military operations, especially in the Iraqi theater of operations, have focused primarily on irregular warfare and stability operations. It is entirely possible that Army transformation and years of conducting irregular operations have caused a similar decline in the U.S. Army's primary tactical warfighting systems' abilities to conduct high intensity conflict. The HBCT must be able to conduct stability and counter-insurgency operations while still maintaining the ability to fight and win major combat operations. It is not too difficult to image scenarios where units deployed for stability operations might have to face a much more conventional opponent requiring a rapid transition in posture and mission. The consequences for not remaining proficient and capable of conducting full spectrum operations are too great. The Hezbollah – Israeli Conflict of 2006 highlights the issues and risks that a military faces when it focuses the bulk of its operating force on irregular warfare neglecting high intensity combined arms operations.⁵⁵ If the HBCT is to remain one of the Army's primary tactical warfighting systems then it must have the necessary force structure and capabilities required to rapidly and continuously transition across the full spectrum of conflict.

The Modular BCT – the U.S. Army's Primary Tactical Warfighting System

The *Army Comprehensive Guide to Modularity Volume I Version 1.0* defines the modular BCT in the following manner: "BCTs will be the primary organizations for fighting tactical engagements and battles."⁵⁶ The concept design for the brigade combat team is a stand-alone system comprised of combined arms organizations. The modular BCT forms the principal tactical unit and subsequently the cornerstone for maneuver and combat operations. The modular BCTs have the embedded force structure to conduct combat, combat support, and combat service

⁵⁴ U.S. Army, *FM 3-0 Operations*, 3-3.

⁵⁵ Mathews, iii, 2, 65.

⁵⁶ Task Force Modularity, *Army Comprehensive Guide to Modularity Volume I Version 1.0* (Fort Monroe: Headquarters, US Army Training and Doctrine Command, 2004), 1-14.

support functions enabling the BCTs to fight more independently than their predecessors. BCTs comprise the Army's combat power that can maneuver against and defeat enemy forces in any land based operating environment.⁵⁷ The modular BCT's design has been restructured to improve its embedded force mixes, command and control framework and sustainability on the battlefield in order to conduct full spectrum operations.⁵⁸ It is clear that one of the directives for the modular BCT is an improvement in the embedded combat units' force mixes. The improvement of force mixes may be true for a majority of the combat units; however it is clearly not true for the engineer forces. The modular HBCT will be explored in more depth in the next section.

The Modular HBCT

The Heavy Brigade Combat Team is one of the three primary BCT organizations within the Army's modular force structure (the other two BCT organizations are the Stryker Brigade Combat Team (SBCT) and the Infantry Brigade Combat Team (IBCT)). All three BCT organizations are optimized for different operating environments; their organizational structure enables them to be more effective and efficient in particular geographic locations. Open and mixed terrain optimizes the HBCT's ability to conduct full spectrum operations. This optimization includes high intensity offensive, defensive, and stability operations against conventional and irregular threats. The HBCT's major limitation is its ineffectiveness at conducting full spectrum operations in mountainous and jungle terrain.⁵⁹

The embedded combined arms forces enable the HBCT to provide superior mobility and firepower in mixed and open terrain. The HBCT is able to conduct full spectrum operations with

⁵⁷ Ibid., x, 1-14, 1-15, 6-1, 6-2.

⁵⁸ Klaude A. "Tony" Miller and David L. Draker, "Combat Support Brigade (Maneuver Enhancement)," *Engineer: The Professional Bulletin of Army Engineers* (January-March 2006): 11.

⁵⁹ Task Force Modularity, 8-1.

incredible shock and speed.⁶⁰ The parameters for transformation further establish the importance of versatility, proper force mixes, and engineer forces in combined arms operations. The modular HBCT is currently transforming from the first generation to the second generation force structure.⁶¹ The engineer specific differences between the first and second generation HBCT structures are the embedded engineer forces in the combined arms maneuver battalions and the Brigade Special Troops Battalion (BSTB) respectively. The first generation HBCT concept has two engineer companies, the E Companies in both of the combined arms battalions. The second generation modular HBCT structure has one engineer company organic to the BSTB. The *Army Comprehensive Guide to Modularity Volume I Version 1.0* states that "... the organic combined arms composition of BCTs enhance their versatility and reduce the need for reconfiguration during mission transitions. They feature balanced, modular, combined arms battalions with engineers integral to heavy maneuver battalions..."⁶² This leads one to ask the question, if engineer forces are so integral to the combined arms battalions, then why has Army transformation reduced the engineer force structure from an engineer battalion to a single company? It can be argued that this reduction in engineer forces will necessitate the HBCT's need for additional assets to support operations and require reconfiguration during mission transitions. The HBCT's reduced engineer forces and reliance on external engineer capabilities and support contradict the parameters established for the modular force. The next chapter, describing the modular engineer force, will address in more detail the HBCT's engineer force structure challenges.

⁶⁰ U.S. Army, *FM 3-0 Operations*, C-6.

⁶¹ Appendices B thru D to this monograph depict the first and second generation HBCT force structures and their embedded force mixes.

⁶² Task Force Modularity, 10-3.

The Modular Engineer Force

Engineers are combat multipliers at all levels of war regardless of the operating environment; engineers are absolutely intrinsic in the Army's ability to successfully conduct full spectrum operations. Engineers are critical in the conduct of combined arms operations and play a major part in the rapid and continual transition across the full spectrum of conflict. The versatility of the engineer force requires engineers to execute a broad range of functions including offensive, defensive, stability and support operations either independently or simultaneous across the depth and breadth of the theater of operations.⁶³ COL Robert Tipton further highlights the importance and relevance of engineers in his December 2008 commandant's message. "Engineers are more relevant than ever – whether it is the route clearance/IED fight, building and protecting our base camps, improving infrastructure or building capacity of those we are supporting; we engineers are making a key difference in every aspect of the fight."⁶⁴ Operations Desert Shield and Desert Storm as well as Operations Iraqi Freedom and Enduring Freedom magnify the importance of engineers on the battlefield.

The one BOS that has been consistently critical at every phase of the campaign – from border obstacle breach, all the way through the attack, to current stability and support operations – and has performed superbly and come through big time for the Corps at every turn ... has been the engineers The engineers have been the most flexible, versatile, multipurpose, and important force – from start to finish – in the campaign...⁶⁵

This section will highlight the different engineer force structures within the Engineer Regiment, discuss the different missions of these force structures, and highlight operations being conducted in execution of the Global War on Terror. Current military doctrine establishes the engineer force

⁶³ U.S. Army, *FM 3-34 (FM 5-100) Engineer Operations*, 8-2.

⁶⁴ COL Tipton, Message to the Regiment #61.

⁶⁵ COL Gregg F. Martin and CPT David E. Johnson, "Victory Sappers: V Corps Engineers in Operation Iraqi Freedom Part I: The Attack to Baghdad and Beyond...", *Engineer: The Professional Bulletin of Army Engineers* (July-September 2003): 9.

concept and missions. Operation Iraqi Freedom provides a lens to view the importance of engineers in today's operating environment.

Engineer Force Concept & Mission Requirements

Army transformation has seen dramatic changes in the force structure of the Engineer Regiment. This modular force has an expeditionary mindset prepared to operate within complex and uncertain environments. The modular engineer force is designed to be a relevant, ready, responsive and reliable force prepared to conduct full spectrum operations in support of the Army's mission.⁶⁶ While force structure within the Regiment may have changed, the three major battlefield functions: combat, general, and geospatial engineering, remain the same. Engineers' roles in combined arms operations are still vitally important. Combined arms integration facilitates mobility, countermobility, and survivability operations as well as geospatial and general engineering support. Engineers support these operations throughout the depth and breadth of any operating environment. The engineer force's ability to support the combat force is embedded in its versatility; under modularity any engineer unit is capable of providing engineer support across the entire spectrum of conflict.⁶⁷

Engineers remain an integral force in offensive operations focusing on providing mobility support to maneuver units. The mobility tasks include, but are not limited to, obstacle reduction and marking, emplacement of situational obstacles to protect the force, engineer reconnaissance, gap crossing, and construction of combat trails. These operations require task organizing engineer forces with maneuver units in order to gain an advantage over the enemy.⁶⁸ Operation Iraqi Freedom's initial attack on Baghdad required immediate engineer support in order to clear and

⁶⁶ LTC Bryan Watson, LTC David Holbrook, MAJ Stephen Bales, MAJ Mollie Pearson, MAJ Brian Slack, and Mike Fowler, "The Future Engineer Force: Projecting the Capabilities of the Regiment," *Engineer: The Professional Bulletin of Army Engineers* (January-March 2004): 7.

⁶⁷ U.S. Army, *FM 3-34 (FM 5-100) Engineer Operations*, 1-5, 4-1.

⁶⁸ *Ibid.*, 1-5, 1-16, 1-18, 3-27.

mark multiple lanes through the obstacle belt along the Iraq-Kuwait border. Engineers were subsequently instrumental in providing assured mobility for Coalition forces during the attack to Baghdad.⁶⁹ Between June 2003 and March 2004, 1st Armored Division and 4th Infantry Division conducted a combined 21 major combat operations. These operations included cordon and searches, cache searches, and raids requiring combat units to transition between independent company, battalion, and brigade centric operations. This rapid and continual transition is indicative of the battlefields of Iraq and highlights the warfighting system's necessity to operate across the spectrum of conflict.⁷⁰ During the first few years of operations in Iraq the traditional combined arms brigades' force structure facilitated its combat effectiveness. The traditional combined arms maneuver brigades had embedded engineer battalions⁷¹; the modular HBCTs do not share the same engineer forces or capabilities.

Similar to offensive operations, engineers play a pivotal role in combined arms defensive operations providing countermobility and survivability support to the force commander. These operations include terrain analysis, constructing defensive fighting positions, and emplacing obstacles in order to maximize friendly force capabilities and minimize vulnerabilities on the battlefield. General engineering support includes improvement to infrastructure, construction management, and real estate acquisitions among a vast array of other tasks. "U.S. Army engineers played a crucial role during the initial attack and continue to do so during the follow-on stability

⁶⁹ COL Martin and CPT Johnson, 4-6.

⁷⁰ Dr. Donald Wright and COL Timothy R. Reese, *On Point II: Transition to the New Campaign* (Fort Leavenworth: Combat Studies Institute Press, 2008), 314-318.

⁷¹ 588th Engineer Battalion, "588th Engineer Battalion (Combat) (Army) Alumni Website: a History ... The Corps of Engineers," 588th Webmaster, <http://www.mendonet.com/588th/engrhist.htm> (accessed March 29, 2009). The website describes the U.S. Army's construct under the provisions of the Engineer Restructure Initiative (ERI). It states "... each heavy division has an Engineer Brigade with three organic divisional engineer battalions organized and equipped to provide combat engineer support. These battalions will support the ground maneuver brigades of armor and/or mechanized infantry and consist of four engineer companies. ... these battalions perform the primary combat engineer missions in the division's sector and forward."; Appendix F – Pre Modularity Divisional Engineer Battalion depicts the engineer battalion force structure that was embedded in a traditional combined arms maneuver brigade prior to Army transformation.

and support operations and rebuilding effort.”⁷² The depth and breadth of engineer functions highlight the importance of engineer capabilities in the execution of combined arms operations.

In addition to engineer specific missions, combat engineers must remain versatile and proficient in reorganizing and fighting as infantry. Fighting as infantry has been the combat engineers’ secondary mission throughout history and this role has not changed under Army transformation.⁷³ Engineers are conducting both engineer specific operations and infantry centric operations during OIF. Engineers units are conducting patrols, raids, traffic control points, and cordon and searches as well as engineer specific tasks.⁷⁴

Military doctrine clearly illustrates that the engineer warfighting functions, force concepts, and mission requirements have remained fairly consistent under Army transformation. However, the engineer forces and capabilities embedded and the methods of engineer support to the new modular HBCTs has changed. The versatility, capabilities, and combat force structure has been drastically reduced in the new modular force structure. The next two sections will describe the engineer force structures and concepts of support representing the current path forward for the Engineer Regiment.

HBCT Engineer Force Structure ~ the “Foundation Force”

The engineer “foundation force” comprises the engineer units that are embedded or organic to their specific BCTs. The engineer force structures within the HBCT, SBCT, and IBCT differ based on each BCT’s primary application on the battlefield. The HBCT’s organic engineer force is designed primarily to provide mobility and basic construction tasks for the maneuver units, but has the capability to provide limited survivability, countermobility, sustainment and

⁷² COL Gregg F. Martin and CPT David E. Johnson, 4.

⁷³ Ibid., 3-28.

⁷⁴ Dr. Wright and COL Reese, 316.

general engineer tasks as well. Engineer command and control is crucial for the successful integration of these engineer functions. The HBCT relies on augmentation from the engineer “force pool,” or engineer force at echelons above the brigade combat team, for capabilities that exceed its embedded engineer company. This engineer augmentation is a mission-specific, generally short duration mission.⁷⁵ The first generation HBCT organization has two organic engineer companies to meet the demands of mobility and construction support. The first generation companies, E Companies, are embedded in the two combined arms maneuver battalions. The E Companies have a Modified Table of Organization and Equipment (MTOE) manning strength of 76 personnel (152 combined for the two companies) with associated combat engineer vehicles and equipment.⁷⁶

The second generation HBCT force structure changes the composition of the organic engineer force. The second generation HBCT organization reduces the number of engineer companies from two to one. The size of the new engineer company has changes as well; its strength increases from the original MTOE strength of 76 Soldiers to the current design of 151 Soldiers. While the first and second generation force structures have almost identical Soldier manning numbers, the biggest differences reside in the second generation’s decrease in company level command and control and lack of habitual relationships between the engineer company and the supported maneuver battalions. Instead of two companies embedded in the maneuver battalions there is one engineer company belonging to the BSTB.⁷⁷

⁷⁵ LTC Watson, LTC Holbrook, MAJ Bales, MAJ Pearson, MAJ Slack, and Fowler, 7-10.

⁷⁶ “Approved Heavy UA v.8.0,” (Presentation created by boninj, DOIM, Fort Monroe, VA, June 28, 2004), slides 1, 7. The first generation HBCT organization is illustrated in Appendix B (Modular HBCT – Generation I) and Appendix C (Modular Combined Arms Battalion (HBCT) – Generation I) to this monograph.

⁷⁷ COL Robert Tipton, “Engineer Capabilities in Support of the Brigade Combat Team,” (Presentation created by the Commandant U.S. Army Engineer School, Fort Leonard Wood, MO, October 25, 2007), slides 10-11. The second generation modular HBCT organization is depicted in Appendix D (Modular HBCT – Generation II) to this monograph.

The second generation HBCT organization highlights some of the glaring issues associated with its engineer capabilities and support. The engineer force structure has devolved from the Engineer Restructure Initiative (ERI) design comprising an engineer battalion with three combat engineer companies totaling 415 Soldiers to the current modular HBCT structure comprising one engineer company with a manning strength of 151 Soldiers. The scope of engineer support is even more startling when understanding that the ERI engineer battalion supported between nine and 12 maneuver companies while the lone modular engineer company supports 11 maneuver companies. Under modularity, one engineer company is now replacing the role of an engineer battalion, but without the required engineer forces and capabilities. Clearly, the HBCTs are not optimized to conduct high intensity operations against conventional forces – one of the primary charters of the HBCT design. Reduction in engineer capabilities and forces requires augmentation from external units to conduct basic engineering battlefield tasks. The U.S. Army Engineer School assessment of the HBCT force structure highlights the lack of engineer capabilities. The most obvious deficiencies include gap crossing, detection and neutralization of explosive hazards, and earthmoving capabilities. Other areas of concern include planning and controlling engineer operations, mobility in complex and urban terrain, attacking enemy freedom of maneuver (countermobility), and enhancing force protection (survivability).⁷⁸ This loss of engineer command and control, capabilities, and forces highlight some of the engineer specific issues that exist in the Army's modular force.

Engineer Force Structure in Echelons above the BCT ~ the “Force Pool”

The engineer “force pool” comprises the engineer forces and capabilities external to the BCT and headquarters' staffs. It supports all echelons of combat forces and operations providing the joint force commander with a full spectrum engineer capability that can be tailored to meet

⁷⁸ Ibid.

specific missions across the operating environment.⁷⁹ The engineer brigade and the maneuver enhancement brigade (MEB) are two primary organizations designed to support a theater of operations. The Army currently has five active duty engineer brigades (18th, 20th, 36th, 130th, and 555th Engineer Brigades); each brigade has its own unique composition tailored to accomplish its specific mission. All five engineer brigades comprise engineer forces that provide assured freedom of action, security and support operations, force security and protection operations, and limited offensive and defensive operations. Essentially the engineer brigade provides expeditionary engineer support to full spectrum operations for their supported joint task force (JTF), corps, division or similar organization.⁸⁰ The major difference between engineer brigades and MEBs is the composition of forces within the respective brigades. Engineer brigades are predominantly engineer centric forces while MEBs are combined arms forces designed for unique missions.⁸¹

The Army current has two active duty maneuver enhancement brigades (1st and 4th MEBs) and is growing the force to a total of four MEBs by fiscal year (FY) 2013 (3rd MEB will be activated in FY 2010 and the 2nd MEB will be activated in FY 2013).⁸² The maneuver enhancement brigade tailors its combined arms force based on METT-TC (mission, enemy, terrain, troops, time, and civilian considerations) to meet the requirements of a specific mission. It occupies terrain and provides maneuver support for the supported commander's theater of operation. The MEB's major battlefield tasks include terrain management, infrastructure

⁷⁹ LTC Watson, LTC Holbrook, MAJ Bales, MAJ Pearson, MAJ Slack and Fowler, 10.

⁸⁰ "555th EN BDE Mission Statement & Brigade METL," 555th Engineer Brigade, <http://www.lewis.army.mil/555/Mission/mission.htm> (accessed January 19, 2009); "20th Engineer Brigade Homepage," 20th Engineer Brigade, <http://www.bragg.army.mil/20ENG/default.htm> (accessed January 19, 2009); "36th Mission," 36th Engineer Brigade, <http://www.hood.army.mil/36thengbde/36thMission.html> (accessed January 19, 2009).

⁸¹ Task Force Modularity, 5-20.

⁸² Army Logistician, "Army announces stationing decisions," *Army Logistician* (March-April, 2008), http://findarticles.com/p/articles/mi_m0PAI/is_2_40/ai_n27943052 (accessed 31 March 2009).

development and support, protection, assured mobility, and rear area operations.⁸³ The MEB headquarters provides the command and control structure for multiple functions on the battlefield; these multiple functions typically consist of engineer, military police, armor, infantry, air defense, and chemical units. Maneuver enhancement brigades have the versatility and flexibility to accomplish a myriad of operations, greatly enhancing a supported commander's ability to execute full spectrum operations. Some of these typical mission sets include establishing, maintaining and securing lines of communication; repairing and restoring infrastructure; protecting critical infrastructure; and acting as a rear area headquarters.⁸⁴

Task Force Able's construction of the Haight-Jordan Bridge illustrates the MEB construct's effectiveness during Operation Iraqi Freedom. Task Force Able was a company level command and control force comprising specific capability oriented forces from the MEB. The task force consisted of horizontal construction, bridging, and combat engineer forces from different parent battalions and Army components (active duty, reserve and National Guard). Task Force Able illustrates the diversity and versatility that MEBs provide the supported commander.⁸⁵ The force pool engineer concept appears to be very solid and practical for low density engineer operations that occur during low intensity conflict. The Haight-Jordan bridge construction occurred during OIF I when heavy divisional brigades had embedded engineer battalions. However, there are many concerns that arise from the engineer force pool concept. First and foremost, the engineer force pool concept greatly reduces the HBCT's embedded engineer capabilities. Additionally there are issues with engineer force pool training oversight, integration and training with combined arms units, and command and control authorization and

⁸³ Miller and Draker, 11-12.

⁸⁴ Task Force Modularity, 1-17, 5-20, 5-21.

⁸⁵ COL Christopher J. Toomey, "Engineer Expeditionary Force Design Concepts – from Theory to Practice in Task Force Able," *Engineer: The Professional Bulletin of Army Engineers* (April-June 2004): 5.

implementation of unique capabilities. The next section will address specific engineer transformation issues and concerns in much greater detail.

Engineer Transformation Issues / Areas of Concern

The National Military Strategy of 2004 highlights the three main priorities that the U.S. military has in order to remain a dominant military power now and in the years to come. These three priorities include winning the Global War on Terrorism, enhancing the joint military communities' warfighting capabilities, and continually transforming for the future.⁸⁶ The third aspect of the National Military Strategy, transforming the military force to be more versatile within the complex adaptive operating environment of the 21st Century is by no means an easy task. The Engineer Regiment similarly has a daunting task attempting to shape the direction of Army transformation to meet the current as well as future operating environments. Army transformation has drastically changed the composition of the HBCT's engineer forces from the ERI design to today's modular Army. Much debate has been occurring on the state of Army transformation and this monograph focuses on the HBCT's engineer transformation. The intent is not to propose groundbreaking recommendations for the engineer force, but instead to use systems perspectives and thinking to provide insight and add to the Engineer Regiment's and the Army community's discussions.

As Dr. Larry Roberts describes, engineer planners in the HBCT have a very crucial challenge in the years ahead educating and ensuring that the leadership understands the full spectrum of engineer capabilities; engineer planners must attempt to shape the HBCT's augmentation force to provide these engineer capabilities.⁸⁷ Clearly the HBCT lacks the embedded engineer experience (particularly at the battalion command level), force structure, or

⁸⁶ U.S. Department of Defense, *The National Military Strategy of the United States of America*, viii.

⁸⁷ Dr. Larry Roberts, "The Evolution of the Engineer Force: Part II," *Engineer: The Professional Bulletin of Army Engineers* (2002): 46.

capabilities the ERI force structure possesses. This section will address the importance of systems perspectives and thinking in understanding the HBCT warfighting system. It will discuss the areas of concern, placing particular importance on weighing some of the drawbacks to the second generation modular HBCT force structure. Five major categories encompass the issues / areas of concern this section will explore. These categories include:

- Application of systems perspectives and systemic thinking
- Reduction in the HBCT's engineer forces and capabilities
- Availability and integration of engineer augmentees
- Command and control of engineer operations
- Engineer training shortfalls

Application of Systems Perspectives and Systemic Thinking

The current and future operating environments present a world of complexity for the U.S. military as it conducts operations. Complexity is at the heart of Army transformation and has been adapted in the military's doctrine and lexicon. The best approach for tackling complexity is to apply systemic thinking and perspectives, an approach that forms the basis for how organizations understand their interrelated parts and operating environment.⁸⁸ Complexity also plays an important role in understanding systemic change. "When an action has a set of consequences locally and a very different set of consequences in another part of the system, there is dynamic complexity."⁸⁹ The force structure changes made to the current HBCT system are dynamic; these changes have an effect either directly or indirectly on the HBCT's other warfighting elements and the true effects may not be felt immediately. The HBCT's ability to execute missions that require assets not habitual to its organization, can greatly affect its

⁸⁸ Senge, 69.

⁸⁹ Ibid., 71.

performance. For example, not having enough engineers to conduct two simultaneous combined arms breaches will require either engineer force pool augmentation or non engineer HBCT units to execute the breaching tasks. In either scenario the lack of embedded engineer capabilities introduces risk into the system. One of the fundamental principles to systemic thinking is ingrained in the interrelationships of the variables and how these interrelated variables affect the system as a whole.⁹⁰

Military doctrine defines a system as a group of nodes and the nodes' causal relationships as links.⁹¹ Accordingly the HBCT's nodes are its habitual military units and the links between these units are ingrained in combined arms operations and warfighting functions. The writings of Ludwig von Bertalanffy, Dietrich Dorner, and Peter Senge provide the academic underpinnings into the development of the HBCT as one of the Army's primary tactical warfighting units. The operating environment's dynamic complexity, the system's interrelated parts, and the time required to identify systemic issues through interactions with the complex adaptive environment are all components of systems' perspectives and systemic thinking.

Ludwig von Bertalanffy, Dietrich Dorner, and Peter Senge all define a system and systemic thinking in very similar manners. Systems theory is the idea of "wholeness", the idea that a system has many interconnected relationships and these relationships affect the entire system not just its individual parts. Ludwig von Bertalanffy defines his general system theory accordingly: "General system theory, therefore, is a general science of "wholeness" which up till now was considered a vague, hazy, and semi-metaphysical concept."⁹² Dietrich Dorner similarly

⁹⁰ Ibid., 73.

⁹¹ U.S. Department of Defense, *JP 5-0 Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 2006), III-18; U.S. Department of Defense, *JP 3-0 Operations* (Washington D.C.: U.S. Government Printing Office, 2008), II-21, II-22, IV-4.

⁹² Bertalanffy, 37.

defines a system as “... a network of many variables in casual relationships with one another.”⁹³

Dorner states that there are three things that need to be done in order to effectively understand and deal with a system. One needs to know the casual relationships among the different parts in the system, how these individual parts relate to the system as a whole, and the system’s larger complexities (i.e. – can certain parts be further broken down into smaller parts).⁹⁴ Understanding the interconnectedness of the subordinate units is paramount in determining whether the HBCT is capable of effectively operating across the full spectrum of conflict.

Systemic thinking provides a long term outlook and understanding of a system that has direct relevance to Army transformation, particularly when addressing the HBCT’s engineer capabilities. “The system viewpoint is generally oriented toward the long-term view. That’s why delays and feedback loops are so important. In the short term, you can often ignore them; they’re inconsequential. They only come back to haunt you in the long term.”⁹⁵ Peter Senge uses the example of an organization that cuts back its research program in an attempt to save money. This initial money savings is effective in the short term, but loss of research prevents the organization from identifying more efficient ways of conducting business. The loss of research results in the business operating at a limited capacity and costs the organization more money in the long run.⁹⁶ Army transformation cut back the HBCT’s engineer capabilities in an attempt to consolidate engineer capabilities at higher echelons. The higher echelon commands have the flexibility to employ the engineer forces throughout the depth and breadth of their operating environment. However, this capability at the higher levels comes at the HBCT’s expense. The necessity to consolidate engineer forces at higher echelons and augment the HBCT with engineer forces as the

⁹³ Dorner, 73.

⁹⁴ Ibid., 79.

⁹⁵ Senge, 92.

⁹⁶ Ibid., 23, 65, 84-92.

situation dictates may have immediate results at the upper echelons; the HBCT's long lasting effects may not be exposed for some time. These long lasting effects include reducing cohesion, integration, training, capabilities, and proficiency in combined arms operations, particularly those requiring engineer capabilities that are not embedded within the HBCT.

The issue at hand is whether the HBCT is able to execute all actions within the full spectrum of operations. Is the system able to address the bounds of its mission? By reducing one of the interrelated parts of the system, the engineer force structure, the system has been slightly changed. Perceived short term improvements to the system, i.e. reducing the engineer force structure and augmenting the HBCT with engineer forces on a mission dependent basis can lead to near term results. However, the long term costs, the HBCT's inability to effectively execute major combat operations with its embedded engineer forces, may prove to outweigh the short term gains. The full impact of this change may not be felt initially and may not even be felt for years. Until we are engaged in major combat operations the true value of systemic thinking may not be realized, and the true effects of Army transformation may not be felt.

Reduction in the HBCT's Engineer Forces & Capabilities

The engineer community has produced much debate regarding the HBCT's engineer force structure; a force structure that reduces the engineer footprint from a battalion to the current second generation model of a single engineer company. The decrease in engineer forces and subsequent decrease in capabilities creates some glaring deficiencies. First and foremost, the HBCT does not possess the embedded engineer support necessary to conduct major combat operations. Operations Desert Storm and Iraqi Freedom provide two distinct examples of major combat operations' reliance on combined arms operations and engineer integration within the maneuver forces.

The Engineer Regiment's lessons learned from Operations Desert Shield and Desert Storm highlight some considerations for major combat operations and provide a lens of

comparison to Operation Iraqi Freedom. Even with the United States' overwhelming successes the Army identified a need for change to meet the changing global security.⁹⁷ The lack of embedded engineer forces and capabilities was one of the most glaring deficiencies during Operation Desert Storm. Combined arms breaching operations proved to be an area of concern for maneuver commanders.⁹⁸ 7th Corps augmented the 1st Armored Division, the 1st Infantry Division, and the 3rd Armored Division with additional engineer forces and established an engineer brigade in each division to facilitate major combat operations.⁹⁹ The divisional units' deficiencies in embedded engineer capabilities were rectified prior to the commencement of Operation Desert Storm. The allocation of engineer forces and capabilities to the maneuver units was the recipe for success. "Maneuver commanders were unanimous in their praise of providing an engineer battalion in support of maneuver brigades."¹⁰⁰ The groundwork for the Engineer Restructure Initiative was established and engineer brigades were subsequently assigned to the divisional forces between Operation Desert Storm and Operations Enduring and Iraqi Freedom.

During 3rd Infantry Division's attack to Baghdad in 2003 the brigade combat teams were still operating under the ERI structure with a combat engineer battalion embedded in the combined arms brigade. Even with this embedded battalion per brigade the divisions still required additional engineer assets.¹⁰¹ Essentially, the combined arms brigades' engineer battalions did not provide enough capabilities for the attack to Baghdad; during OIF I the brigades were augmented with additional engineer forces. This begs the question, if the 3rd Infantry Division reinforced its engineer capabilities for the attack to Baghdad, then why has Army transformation reduced the

⁹⁷ COL Gregory Fontenot, LTC E.J. Degen, and LTC David Tohn, *On Point: The United States Army in Operation Iraqi Freedom* (Fort Leavenworth: Combat Studies Institute, 2004), 1, 26.

⁹⁸ U.S. Army, *The United States Army Engineer After Action Review for Operations Desert Shield and Desert Storm* (Fort Leonard Wood: U.S. Army Engineer School, 1993), Training – 3.

⁹⁹ *Ibid.*, C-4-5.

¹⁰⁰ *Ibid.*, Command and Control-5.

¹⁰¹ COL Martin and CPT Johnson, 5.

engineer force structure from a battalion down to a company? While the operating environment may have reduced the threat of major combat operations, the Hezbollah – Israeli conflict of 2006 cautions that transition to major combat operations may occur rapidly and continuously. It is imperative for the HBCT to be postured to execute full spectrum operations. The decision to consolidate the majority of engineer force capabilities at echelons above brigade and augment the BCTs as the situation dictates provides contradictory relationships; the HBCTs are designed to provide superior mobility and firepower, but do not have the proper engineer capabilities to conduct high intensity combined arms operations.

The HBCT, as a stand-alone warfighting system, should have the interrelated subordinate parts (units) necessary to conduct full spectrum operations. These subordinate units execute combined arms operations spanning the Army's warfighting functions. The HBCT units maintain constant interactions with one another, particularly during combat operations and especially during high intensity conflict. If any HBCT unit does not have the capabilities required to conduct its warfighting functions or missions then the HBCT is not able to effectively conduct its missions. Not all tasks are equal, and in some circumstances some tasks are more important than others. One specific example is the HBCT's ability to conduct offensive operations in terrain that requires gap crossings. Gap crossing represents a single point of failure for the HBCT and if the HBCT is unable to bridge the gap then the offensive operations will fail. Reducing the HBCT engineer capabilities and removing gap crossing assets from the engineer force has created increased risk for the HBCT. Is this increased risk acceptable for maneuver forces? Systems perspective clearly highlights the importance of interrelationship among the variables and these relationships impact on the whole of the system.

Dietrich Dorner describes how organizations often have issues with unrecognized contradicting demands and how these contradictory demands often see the organization replace one problem with another. He further describes how this can lead to a vicious cycle that often repeats itself. From an engineer vantage point, it appears Army transformation's reduction of

HBCT embedded engineer capabilities creates a vicious cycle replacing one problem with another. Combat operations during Operations Desert Shield and Desert Storm identified the combined arms division's shortage of engineer forces and capabilities; particularly within the mechanized and armored divisions (we will call this problem X). This problem was solved through operational experience in the early 1990s; the Army restructured its forces through the Engineer Restructure Initiative. The Army embedded engineer brigades in divisions and engineer battalions in combined arms maneuver brigades. Since then the Army has been faced with new and different challenges, primarily challenges revolving around counter-insurgency and stability operations (we will call this problem Y). The Army's recent transformation attempts to address the obstacles inherent in problem Y by restructuring the combined arms maneuver brigades into smaller, more versatile and more deployable force structures. This transformation greatly reduces the HBCT's embedded engineer capabilities. Solving problem Y creates problem X all over again – lack of embedded engineer capabilities in the HBCT.¹⁰²

Several officers returning with combat experience during Operations Iraqi Freedom share the view that the HBCT's engineer force structure is not sufficient for the conduct of full spectrum operations. COL O'Hara addresses the lack of engineer support in his research by stating that the current force structure is not adequate to support the maneuver battalions. He postulates that the BCT does not adequately represent the engineer force and its expertise.¹⁰³ COL Eckstein similarly shares the view that the BCT's engineer forces are not adequate for conducting full spectrum operations. "My experience in Iraq reinforces that we do not have enough engineers in the force structure." COL Eckstein emphasizes that BCTs will need additional engineer assets in order to accomplish a preponderance of their missions and concludes that the Engineer

¹⁰² Dorner, 66.

¹⁰³ COL O'Hara, 15-17.

Regiment needs to bring back engineer capabilities at the battalion and company level.¹⁰⁴ MAJ Derosier's and MAJ Schultze's monographs also highlight the BCT's lack of engineer units and capabilities. MAJ Derosier concludes that the reduced embedded engineer assets limit the BCT's ability to conduct combined arms operations, stating that the loss in engineer capabilities greatly hinders a combined arms unit's ability to conduct breaching, stability and survivability operations.¹⁰⁵

Many leaders across the Engineer Regiment share the belief that the HBCT needs additional embedded engineer assets. This view also transcends the Engineer Regiment; the maneuver community shares the concern. COL Robert Tipton, the commandant of the United States Army Engineer School (USAES), in the December 2008 update to the Engineer Regiment, highlights the maneuver commanders' desires and needs for more engineer forces. "All of our maneuver brethren continue to tell me how well their engineers are doing and how they need more engineers in their formations."¹⁰⁶ One company does not provide the necessary engineer force or capabilities required to rapidly and continuously execute full spectrum operations, especially if conducting major combat operations similar to the attack to Baghdad in 2003 or Operation Desert Storm in 1991.

Availability & Integration of Engineer Augmentees

The engineer brigade and MEB concepts make perfect sense for providing engineer capabilities and support to the supported theater commander; the engineer force pool concept provides a great design for developing a base of engineer support for a theater of operations. However, the HBCT's depleted engineer capabilities limits its engineering versatility and

¹⁰⁴ COL Eckstein, 63.

¹⁰⁵ MAJ Derosier, 33-34; MAJ Schultze, 1.

¹⁰⁶ COL Robert Tipton, Message to the Regiment #61.

flexibility. Army transformation requires the HBCT to rely on engineer capabilities from units outside its organizational control, completely contradicting the lessons learned from Operation Desert Storm. The ERI was a deliberate process to rectify combined arms deficiencies and provided timely, responsive, and embedded engineer planning, capabilities, relationships, and forces to the Army's primary warfighting system. These lessons from 1991 appear to be lost in the wake of the Army's transformation to a modular force.

The availability and integration of engineer force pool capabilities provides a critical dilemma for HBCT organizations. The engineer force pool units and capabilities are controlled at echelons above the BCT, usually at the land component command level. Operational environment considerations help generate the engineer force pool requirements and the units deploy to support the theater's general engineer needs. Echelons above the BCT control the engineer force pool assets providing the supported commanders with greater flexibility and versatility in their prioritization and execution of engineer operations. However, the flexibility and versatility present at the higher levels is absent at the primary tactical warfighting levels. Allocation of engineer force pool assets becomes a mission dependent, priority of effort analysis. With this engineer capability outside the HBCT's control, the HBCT is reliant upon its higher headquarters to provide the proper resources to conduct the majority of its engineer specific tasks and operations. When the engineer force pool does not have sufficient assets to support competing demands the higher level commander must allocate the limited resources based on the priority of effort. It is quite conceivable that BCTs may not receive the required engineer capabilities needed to accomplish their missions. It is clear that establishing the engineer force requirements for a given theater of operations has a significant impact on the supported BCTs. Careful consideration must be given to the requirements of a given operating environment in order to deploy the proper engineer forces. "We must send only what is needed when it is needed, for as long as it is needed

– and nothing more.”¹⁰⁷ The National Military Strategy of 2004 similarly directs the force requirements be developed for a given theater of operations according to the campaign objectives.¹⁰⁸

Dietrich Dorner discusses the very complex nature of systems that have relationships between their interdependent parts. Army commanders must make decisions on the force requirements required to obtain campaign objectives. These decisions must be weighed against the interdependence of the actors (units) within the system. The HBCT, as its own system, is dependent on the engineer force pool to execute operations across the full spectrum of conflict. If this engineer force pool cannot provide the necessary requirements then the internal dynamics of the system are disrupted.¹⁰⁹ It is clear that much emphasis is placed on developing the resource requirements for force deployment prior to entering a theater of operations and without a doubt this emphasis should be demanded of our military planners. However, in today’s complex adaptive environment the ground truth one day can become obsolete 90 days later. What happens when the conditions change and the force requirements planned for do not meet the requirements to accomplish a reframed operating environment? The HBCT no longer has the engineer capabilities and expertise to accomplish a wide variety of combat and general engineer operations.

If the capability gap is not supported by augmented engineer forces then maneuver forces may be required to execute engineer operations for which they are not properly trained and resourced. This introduces more risk in military operations, operations that already have enough risk as a result of the operating environment and its inherent complexity. Army transformation, as described in the *Army’s Comprehensive Guide to Modularity Volume I Version 1.0*, is about

¹⁰⁷ LTC Watson, LTC Holbrook, MAJ Bales, MAJ Pearson, MAJ Slack, and Flowers, 7-15 (the direct quote is from page 11).

¹⁰⁸ U.S. Department of Defense, *The National Military Strategy of the United States of America*, 4.

¹⁰⁹ Dorner, 37.

accepting risk in order to create more standardized and deployable brigade sized organizations.¹¹⁰ Extreme importance is placed on planners to properly bind a problem (if that is possible) and determine the amount of engineer pool forces that will be required for a given operating environment. The true risk is the HBCT's ability to conduct full spectrum operations if the engineer force pool assets are not available to supplement current engineer capability shortfalls.

The engineer force pool's nature of operations will see its units augmenting numerous BCTs throughout their deployment to a theater of operations. The effective integration of these augmenting units may not seem like a glaring issue, but it can have subtle affects on the supported HBCT. COL Don Young highlights his concerns with the engineer force pool concept stating that integration and true understanding of commander's intent are missed when engineer units are augmenting a BCT versus being embedded within the BCT. He explains how the true understanding of the commander's intent, being able to anticipate and understand the commander's priorities as well as those of the team, are lost on augmenting units.¹¹¹ COL Lou Marich discusses some of these issues and highlights how these concerns are not just inherent in combat operations but spread to the family readiness groups (FRG) as well. The FRG issues can often be exacerbated when the BCT and augmenting units are not from the same installation. COL Marich also addresses the BCTs' lack of senior engineer leadership required to properly integrate, advise, and oversee engineer operations.¹¹² The command and control of engineer forces can be mitigated when the BSTB commander is an engineer; however, there is no guarantee that the BSTB commander will be an engineer officer. The HBCT's shortfall in engineer leadership to command and control engineer operations will be addressed in more depth in the next section.

¹¹⁰ Task Force Modularity, 1-15.

¹¹¹ COL Young, interview.

¹¹² COL Marich, interview.

Command & Control of Engineer Operations

Perhaps the most glaring deficiency in the modular HBCT force structure is the lack of senior level engineer expertise. COL Don Young provides some valuable insight into the concerns maneuver commanders face without senior engineer commanders in their organizations.

When you start talking to the one-, two-, three-star general officers who are in theater now, they're always asking, "Where is my engineer?" there's so much value added in having that engineer brigade commander organic to the division commander, and then the BCT commander having the engineer battalion commander right there. Especially with this kind of operation where you have one task force doing high intensity and you have another one that is over doing stability operations and the next day they are switching. You're getting the full spectrum of conflict all in one BCT sector, yet you are going in crippled with no organic engineer battalion commander under the new structure we have transformed with modularity.¹¹³

FM 3-34 also addresses the engineer commander's role in advising maneuver commanders on engineer related tasks and operations. It states that engineer commanders must be prepared to educate and advise their supported commanders on their engineer unit as well as engineer force pool capabilities.¹¹⁴ The only time the HBCT will have an embedded engineer O5 commander is if the BSTB is commanded by an engineer officer; however, the BSTB command is not specifically coded for engineer officers. In most cases the senior engineer officer in the HBCT will be the O4 engineer on either the HBCT staff or slotted as the BSTB Executive or Operations Officer. COL Robert Tipton also addresses the challenges with engineer command and control in his December 2008 monthly update to the Engineer Regiment. "Clearly we have some big challenges ahead on the organizational front – to include engineer command and control at the BCT and Engineer Brigade level, ..." ¹¹⁵ The commander to commander relationship no longer exists, making advising and educating supported commanders on engineer capabilities and methods of execution that much more difficult.

¹¹³ COL Young, interview.

¹¹⁴ U.S. Army, *FM 3-34 (FM 5-100) Engineer Operations*, 4-2.

¹¹⁵ COL Tipton, interview.

Simply stated, the lack of senior engineer commanders equals a less successful anticipation of changing engineer requirements and transition throughout full spectrum operations intensifying the problems created when integrating augmenting units. COL Roger Wilson expresses his concerns in the BCT's lack of expertise necessary to effectively integrate the engineer capabilities and execute reconstruction tasks. He raises the question: who does the HBCT commander rely on to provide the years of experience and expertise that engineer battalion commanders possess?¹¹⁶ MAJ Schultze draws similar parallels stating that the lack of division and BCT level senior engineer leadership is magnified through the operating environment's propensity for stability and reconstruction operations.¹¹⁷ The augmenting units do not have an engineer command and control unit to fall under and HBCT commanders will continuously feel this impact as their units are conducting operations.

Who in the HBCT is going to ensure the proper integration and full understanding of engineer capabilities as well as provide subject matter expertise and oversight on engineer forces and operations? COL Young professes the need for both an engineer battalion commander and an engineer battalion in the maneuver brigades.

We're cutting off the maneuver commander's right arm by not being able to have an organic engineer commander there advising him. ... we were going from strategic down to tactical every day. ... Engineers bring that capability to the maneuver commander. Probably the biggest lesson learned is to put the engineer brigade back into the division and put the engineer battalions back into the BCTs.¹¹⁸

Without an engineer battalion commander this role may reside on the shoulders of the HBCT engineer planner or one of the BSTB field grade engineer officers. In either case, the experience and expertise of an engineer battalion commander is lost. The HBCT's senior engineer leadership deficiencies also affect the fifth major area of concern, engineer training shortfalls.

¹¹⁶ COL Wilson, 8.

¹¹⁷ MAJ Schultze, 11.

¹¹⁸ COL Young, interview.

Engineer Training Shortfalls

As a result of lessons learned during Operations Desert Shield and Desert Storm, the Army embedded engineer brigades in armored and mechanized divisions. These engineer brigades provided a planning staff to the division headquarters as well as combat engineer battalions with habitual relationships to each of the divisions' maneuver brigades. All signs were pointing to a restructuring of the engineer forces to better support the maneuver units as well as improve training and combined arms proficiency. The ERI enabled the engineer forces to be combat multipliers for the divisions and brigades greatly improving combat efficiency. "Division engineer brigade force structures, according to the ERI concept, were highly successful in supporting four of the five deployed armored and mechanized divisions during Operation Desert Storm."¹¹⁹ The ERI highlights the improved combined arms proficiency when maneuver units have embedded engineer forces to train with at home station and deploy with during combat operations. Habitual relationships are very important and should not be understated. Familiarity with standard operating procedures (SOPs), the commander's intent, and knowing the units within the combat team are instrumental in developing esprit de corps and combat effectiveness. The Army's modular force structure has offset the ERI's strides to improve combined arms deficiencies.

The Commander of the Joint Chiefs of Staff, Admiral Michael G. Mullen, recently published an article in the *Joint Forces Quarterly* addressing his observations of the U.S. Army. The four points he emphasizes are: 1) the meaning of "hooah;" 2) the Army's proficiency as a counterinsurgency force; 3) the need to maintain conventional capabilities; and 4) the need for the

¹¹⁹ U.S. Army, *The United States Army Engineer After Action Review for Operations Desert Shield and Desert Storm*, Command and Control-3.

peacetime requirements for our wartime veterans.¹²⁰ Admiral Mullen identifies training issues and shortfalls that are very indicative of the crossroads the U.S. Army currently faces with the GWOT's preponderance of COIN and stability operations.

Third, I have learned that it is irresponsible to neglect the continual improvement of our conventional capabilities. ... We need more balance in the way we think, train, and resource ourselves. Very real threats still exist from regional powers who possess robust conventional and, in some cases, nuclear capabilities. We must restore some of the more conventional and expeditionary expertise that we will require in the uncertain years ahead.¹²¹

Admiral Mullen's emphasis on training and maintaining a conventional fighting force highlights one of the major concerns that currently exist in the HBCT; the HBCT's lack of engineer forces and capabilities prevent it from properly integrating, training, and executing combined arms operations.

Training is at the heart of the Army's ability to effectively operate across the full spectrum of conflict. The December 2008 version of *FM 7-0 Training for Full Spectrum Operations* focuses on training and its importance in full spectrum operations. While much focus has been placed on counter-insurgency operations, the Army cannot lose focus on its ability to conduct major combat operations.¹²² The HBCT's training predominantly occurs with its embedded units (as previously noted there is only one embedded engineer company in the HBCT). Engineer units play a pivotal role in full spectrum operations; the HBCT's one organic engineer company is not sufficient to accomplish the wide range of engineer operations. Augmenting engineer force pool assets provide the capabilities for mission specific operations; however, these augmenting units have limited if any training with the HBCT prior to the execution of combat operations. This lack of training and familiarity is a direct result of the

¹²⁰ Admiral Michael G. Mullen, "From the Chairman: What I Have Learned about the Army," Joint Forces Quarterly, Issue 52 (1st Quarter 2009): 8-9.

¹²¹ Ibid., 8.

¹²² U.S. Army, "FM 7-0 Training for Full Spectrum Operations (December 2008)," 1-3.

modular structure's stripping of engineer forces and has the potential to deteriorate the HBCT's ability to conduct combined arms operations.

The authors of *On Point* address the issues that arise when warfighting systems rely on frequent reorganization to conduct combat operations. Augmentation of forces to conduct specific operations comes at a price; the most pertinent price is the unfamiliarity between supported and supporting units and the lack of training prior to deployment and execution of operations in a combat zone. The importance of unit cohesion and the building of combat effective and efficient combined arms teams begin with training.¹²³ It is not uncommon for HBCTs to be augmented by engineer units that come from different divisions and different military installations; units that have never trained or operated together prior to deployment.

The HBCT's lack of senior engineer officers further complicates its combined arms training challenges. The engineer battalion commander is responsible for teaching, coaching, and mentoring junior officers and units within the command. Unfortunately, the HBCT does not have this mentorship relationship between the engineer battalion commander and the engineer company commander; the engineer company commander is negated valuable mentorship, advice, expertise, and training oversight. The immediate impacts may not be felt, but over time the lack of senior engineer mentorship could potentially have lasting and damaging effects on the engineer company's ability to know, understand, execute, and maintain its functionality on the battlefield. The HBCT is a system that relies on the interrelationships of its individual units. Engineer battalion commanders are essential in the maturation process of engineer companies and platoons. The lack of an embedded engineer battalion may not be a showstopper, but it clearly hinders the development, training, and combat effectiveness of the HBCT's single engineer company.

¹²³ COL Fontenot, LTC Degen, and LTC Tohn, 399.

Conclusions

In response to the operating environment's demands, the U.S. Army has centered a preponderance of its military efforts on COIN and stability operations; Army transformation's primary purpose is to restructure the fighting force to meet these demands. Subsequently, the Engineer Regiment has developed an engineer force tailored to execute COIN and stability operations under Army transformation's manpower and equipment constraints. It can be argued that the HBCT's embedded engineer capabilities and augmented engineer force pool support may be adequate to conduct stability and COIN operations. However, history has proven that the Army's warfighting system requires much more robust embedded engineer forces and capabilities during major combat operations.

The current HBCT force structure does not have the engineer forces and capabilities necessary to conduct its engineer warfighting functions: mobility, countermobility, survivability, and general engineering. Viewing the HBCT holistically, if one of the interrelated parts is unable to function properly across the full spectrum of operations then there is a possibility that the entire system is unable to operate effectively. The Israel – Hezbollah conflict in 2006 provides a striking example of a far superior military whose primary focus on COIN and stability operations deteriorated its ability to effectively integrate and execute combined arms operations; subsequently, the IDF's warfighting system broke down. The U.S. military must ensure it does not repeat these mistakes.

Recommendations

The HBCT's engineer force structure needs to be relooked in order to more effectively accomplish the operating environment's full spectrum demands. There are three potential recommendations for improving the HBCT's force structure:

- 1) Reestablishing the combat engineer battalion
- 2) Reestablishing the engineer battalion command structure

3) Establishing two engineer companies

The third generation HBCT force structure should provide mobility, countermobility, survivability, and limited general engineering capabilities required to execute full spectrum operations. The engineer force pool concept is a great way to manage specific low density engineer assets (i.e. bridging units); however, HBCTs need more robust embedded engineer capabilities and command and control structures. One engineer company simply does not provide the capabilities required to rapidly and continuously transition across the full spectrum of conflict.

Reestablishing the Combat Engineer Battalion

The HBCT needs to consider reestablishing an embedded combat engineer battalion very similar in concept to the Engineer Restructure Initiative model. In the current HBCT structure there are a very limited number of senior engineer leaders. The HBCT is allocated an engineer planner (O-4) and has the potential to have an engineer field grade officer as part of the BSTB leadership team (this is not guaranteed). An engineer battalion would provide capabilities to conduct mobility, countermobility, and survivability tasks as well as limited general engineering support. It would also provide the expertise and command and control functions necessary to communicate, coordinate, and integrate external engineer assets to accomplish diverse mission sets. The engineer battalion's ability to operate as a maneuver battalion adds an additional ground owning headquarters within the HBCT's area of operations increasing the HBCT's versatility and flexibility. A combat engineer battalion possesses the forces and capabilities to operate in an engineer specific role or a secondary role and fight as infantry greatly enhancing the HBCT's ability to execute full spectrum operations.

Reestablishing the Engineer Battalion Command Structure

The HBCT's next generation of changes should reestablish the engineer battalion command structure, whether an engineer centric sapper battalion or the BSTB. The lack of senior

engineer leadership creates problems for command and control of engineer operations, integration and oversight of augmenting engineer forces, and training of engineer units in preparation for combined arms operations. The engineer battalion is an essential part of the combined arms maneuver brigade and the engineer battalion commander is an essential part of the command team. The engineer battalion command structure's responsibilities include providing the HBCT with engineer expertise, advice, and oversight on engineer operations as well as integrating engineer force pool capabilities. With such a heavy reliance on external engineer support, a senior level engineer commander is essential for the HBCT's conduct of full spectrum operations.

Establishing Two Engineer Companies

Realizing that returning to the engineer battalion structure may be unrealistic in the immediate future, there are steps that can be taken to improve the HBCT's engineer structure and capabilities. At a minimum, the HBCT needs to comprise two engineer companies, similar in concept to the first generation force structure and similar in design to the second generation engineer company. Each sapper company should have at least four line platoons; these four line platoons would provide the maneuver battalion's four companies with an engineer capability to conduct mobility, countermobility, survivability and limited general engineer support. Reestablishing the HBCT's engineer battalion is the most effective way to support full spectrum operations from both a command and control and capabilities perspective; however, establishing two engineer companies begins to address the HBCT's deficiency in embedded engineer capabilities.

Areas for Improvement / Further Research

This monograph addresses the HBCT's embedded engineer capabilities and highlights five major areas of concern. These areas of concern include: 1) application of systems perspective and systemic thinking; 2) reduction in the HBCT's engineer forces and capabilities; 3)

availability and integration of engineer augmentees; 4) command and control of engineer operations; and 5) engineer training shortfalls. These five areas are not all inclusive; there are many subjects of further research that would prove valuable in analyzing the HBCT's embedded engineer capabilities.

The HBCT's development of the company grade engineer officers and non-commissioned officers presents a glaring issue for the future of the Engineer Regiment. Who is responsible for training and evaluating the engineer platoons on their combat skills and proficiencies (Sapper Tables)? The engineer senior mentorship of platoon leaders and company commanders is an imperative part of an engineer officer's maturation process. With the void of an engineer battalion, it appears the HBCT does not have the expertise required to properly train the engineer company. Further analyzing the ramifications for the engineer company made provide valuable insight into the HBCT transformation debate. Time will be the measuring stick to determine what effect this will have on the future leaders of the Engineer Regiment.

Transformation is not a new concept and many trend lines exist throughout the U.S. Army's history. This monograph focused on Army transformation from Operations Desert Shield and Desert Storm to the present, neglecting Army transformation prior to the 1990s. Looking at the role of engineers in WWII, the Korea War, Vietnam and other conflicts would provide more depth for analyzing the impacts of Army transformation. Trend lines can also be a framework for exploring the three BCTs' commonalities and differences in the embedded engineer capabilities required to execute full spectrum operations. The HBCT, IBCT, and SBCT are all designed to provide unique capabilities on the battlefield. This monograph did not draw parallels (if parallels do exist) between the three warfighting systems' engineer capability gaps. Do the SBCTs and IBCTs have the same issues associated with a lack of embedded engineer capabilities or does the engineer force pool support concept provide the necessary capabilities for the IBCT and SBCT to conduct full spectrum operations?

This monograph places a great deal of emphasis on analyzing the HBCT's ability to execute full spectrum operations with its current engineer capabilities, particularly the engineer capabilities required to conduct major combat operations. Very little attention was given here to the HBCT engineer requirements during reconstruction operations. It may strengthen the argument to analyze the HBCT's requirements for general engineer support during low intensity conflict. Studying the evolving role of engineers in an undeveloped theater of operations provides an important area for further research.

Lastly, commanders and leaders from the field provide some of the most valuable insights into the ongoing debate and proper structure of engineer forces and capabilities. The HBCT warfighting system has been tested in two theaters of war and we need to draw lessons from these in terms of actual demands to keep the force small and versatile. Versatility is important, but not at the expense of force survival. While this monograph was able to explore some of the interviews and reports from commanders and leaders during OIF, much more insight should be forthcoming as leaders redeploy and describe their experiences. This monograph explores the viewpoints of senior engineer leaders, however, HBCT senior level input and analysis is very limited. Future study and input from HBCT commanders and staff is very valuable and will provide credence to the debate. The voice of the greater military community is imperative in order to reach an Army solution to the HBCT's systemic problem. Particular questions to consider include their beliefs on the HBCT's current engineer capabilities, the HBCT's required engineer capabilities, and any issues that exist due to the lack of a senior engineer commander and adviser for engineer operations. Input from the engineer community is very beneficial, but this debate involves the entire Army; it is not just an engineer perspective, it is a systems perspective. The full weight and ramifications of modularity may not be felt for years to come, but it is imperative that the Army community continues to discuss the state of the Engineer Regiment and weigh in on the debate. The engineer force must remain "Relevant, Ready, Responsive, and Reliable" in order to meet the challenges of the 21st Century.

APPENDIX A – Full Spectrum Operations

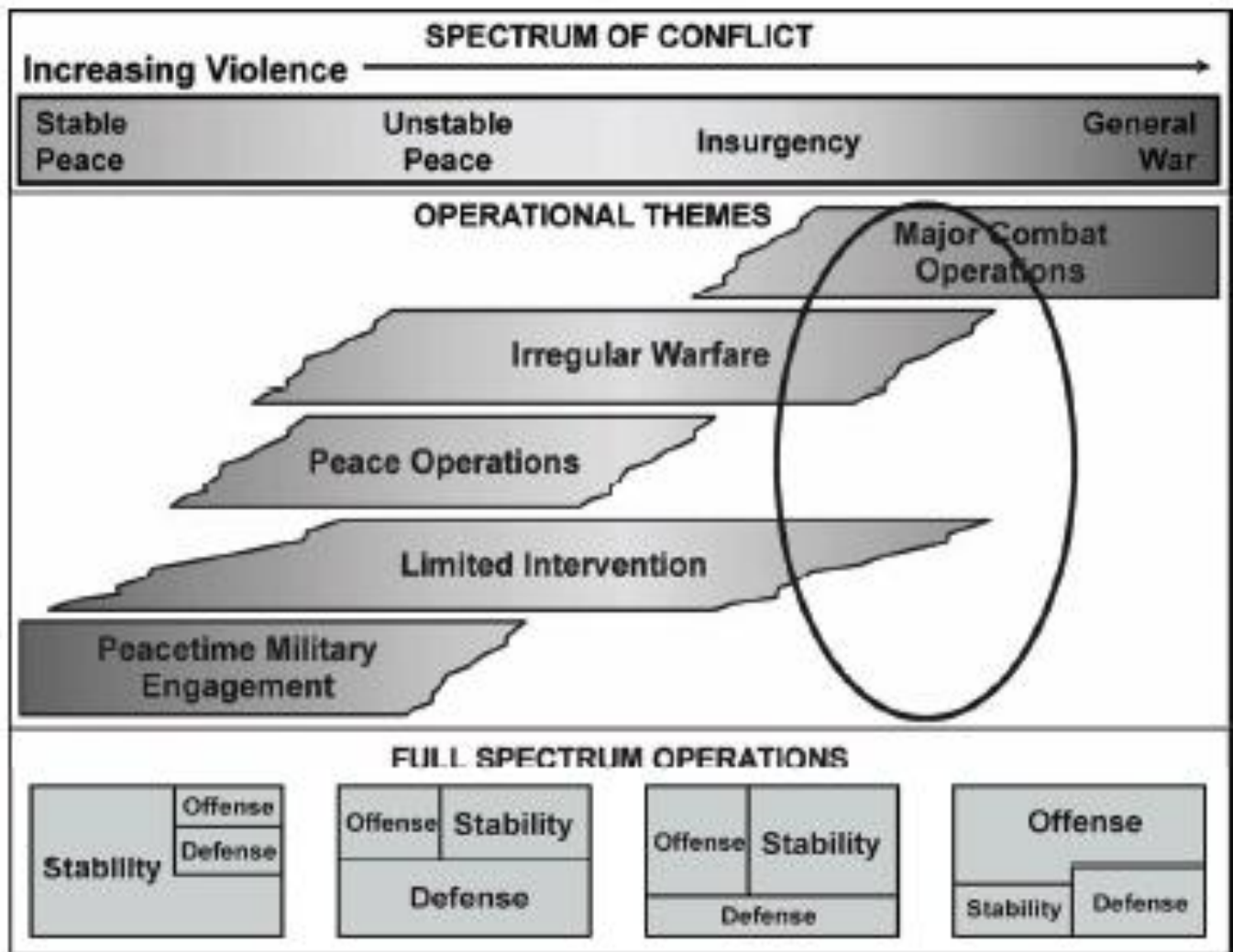


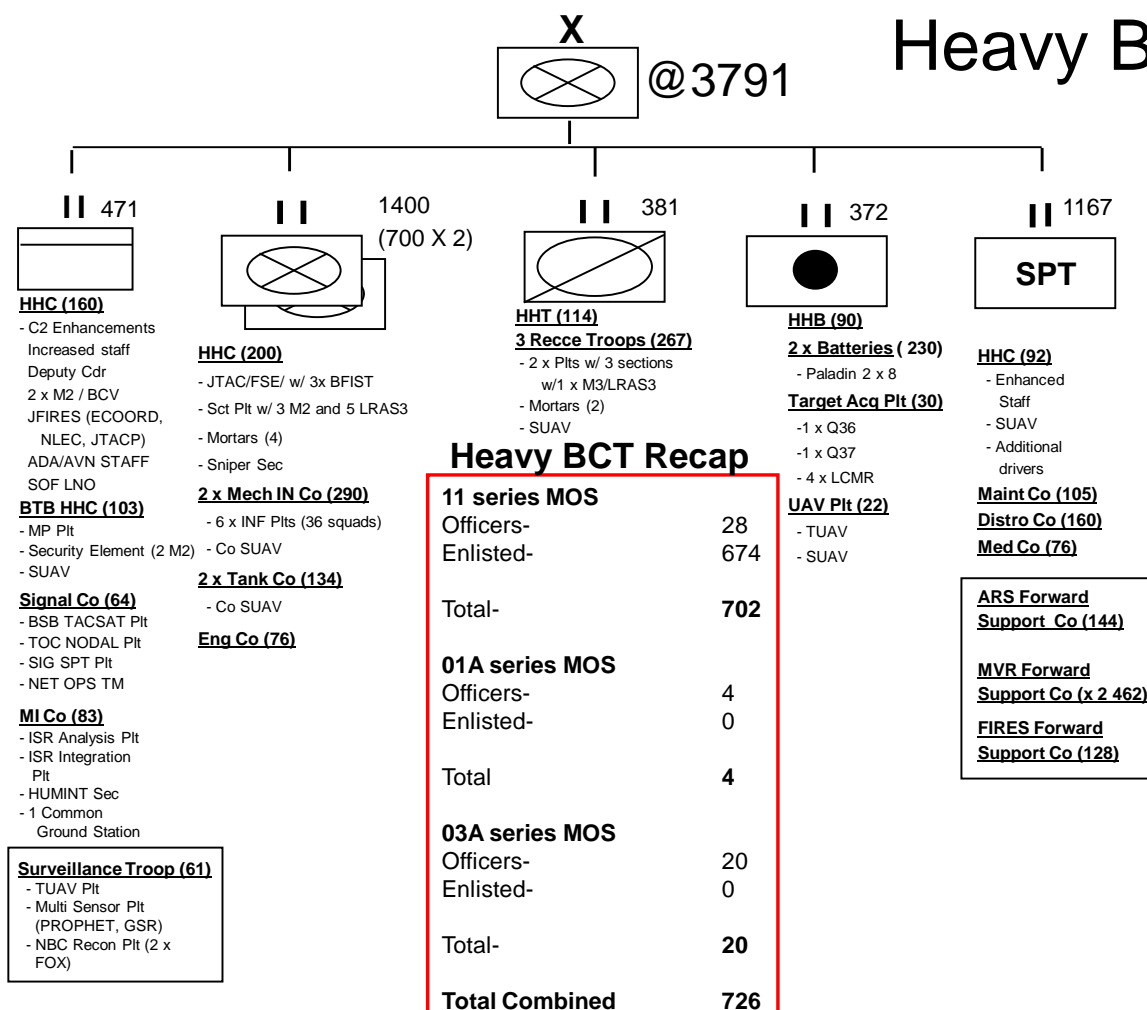
Figure 1-1. Aim point for Army training and leader development

124

¹²⁴ U.S. Army, "FM 7-0 Training For Full Spectrum Operations (December 2008)," U.S. Army Combined Arms Center, <http://usacac.army.mil/cac2/FM70.asp> (accessed December 17, 2008). The figure is copied directly from the pdf file for *FM 7-0 Training For Full Spectrum Operations (December 2008)* and is Figure 1-1 located on page 1-7.

APPENDIX B – Modular HBCT – Generation I

Heavy BCT



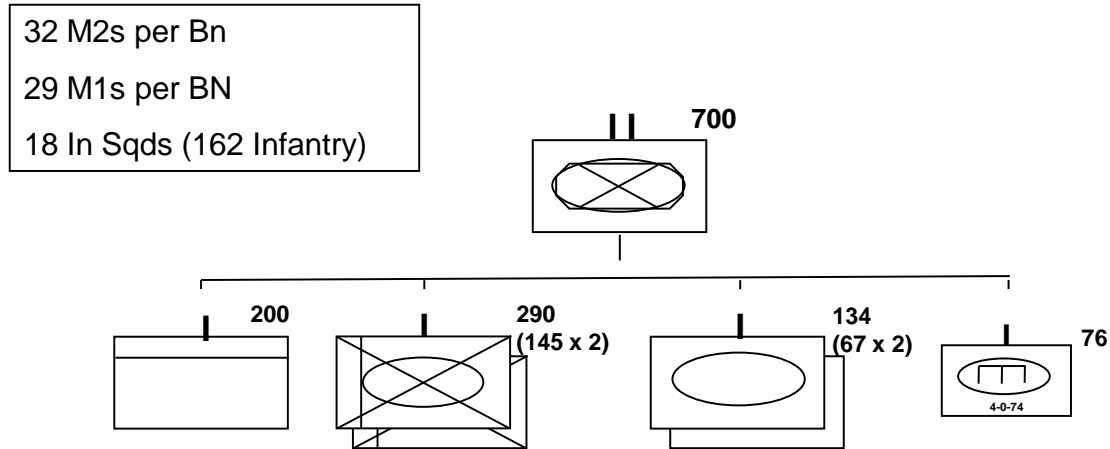
Heavy UA Design v8.0 170028June 04

1 125

¹²⁵ “Approved Heavy UA v.8.0,” (Presentation created by boninj, DOIM, Fort Monroe, VA, June 28, 2004). This slide was copied directly from the PowerPoint presentation; the author listed in the properties to the presentation is boninj.

APPENDIX C – Modular Combined Arms Battalion (HBCT) – Generation I

Maneuver Battalion



Mnvr Bn Recap

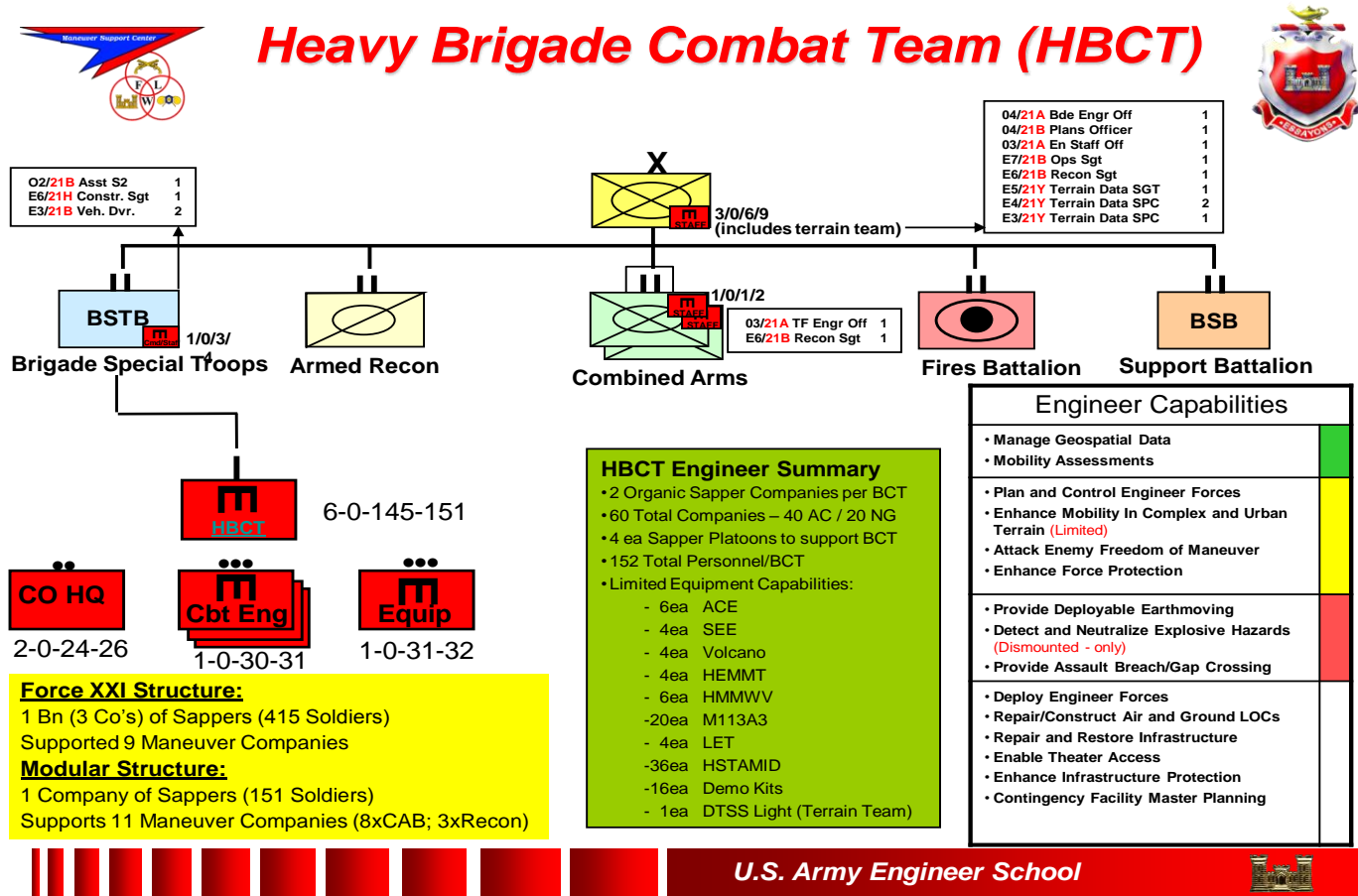
11 series MOS (2 Mnvr Bn)	
Officers-	24
Enlisted-	598
Total-	622
03A series MOS (2 Mnvr Bn)	
Officers-	16
Enlisted-	0
Total-	16

Heavy UA Design v8.0 170028June 04

7 126

¹²⁶ “Approved Heavy UA v.8.0,” (Presentation created by boninj, DOIM, Fort Monroe, VA, June 28, 2004). This slide was copied directly from the PowerPoint presentation; the author listed in the properties to the presentation is boninj.

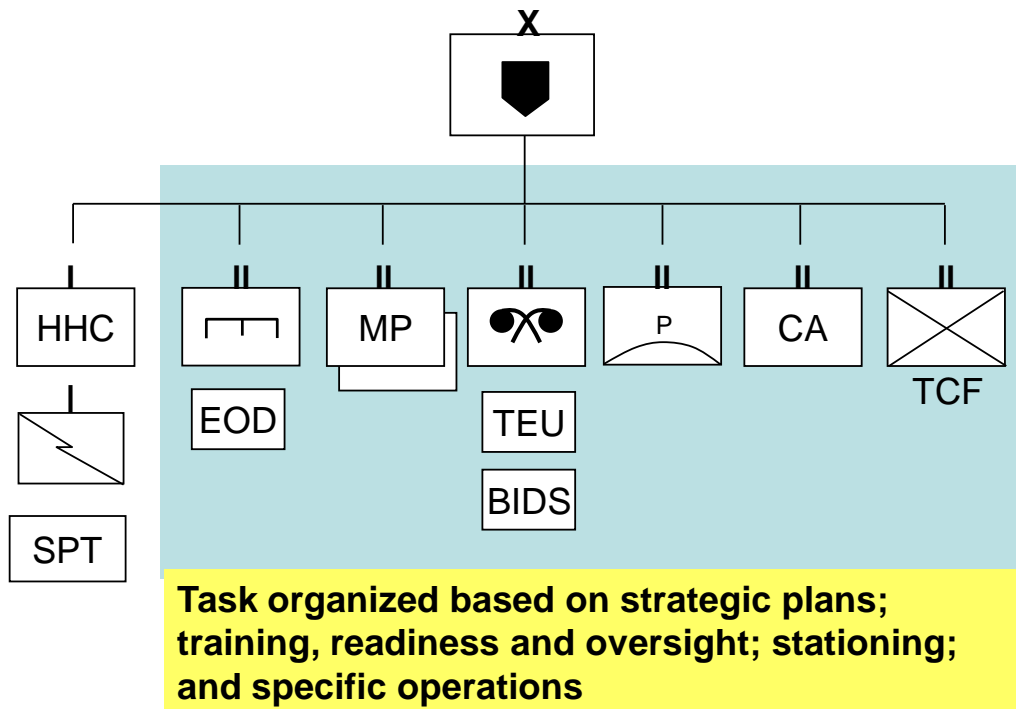
APPENDIX D – Modular HBCT – Generation II



127

¹²⁷ COL Robert Tipton, "Engineer Capabilities in Support of the Brigade Combat Team," (Presentation, Commandant, U.S. Army Engineer School, Fort Leonard Wood, October 25, 2007). This slide was copied directly from COL Tipton's PowerPoint presentation.

Maneuver Enhancement Brigade



¹²⁸ “Modular Army Overview,” (Presentation created by burkem, DOIM, Fort Monroe, April 5, 2005). This slide was copied directly from the PowerPoint presentation; the author listed in the properties to the presentation is burkem.

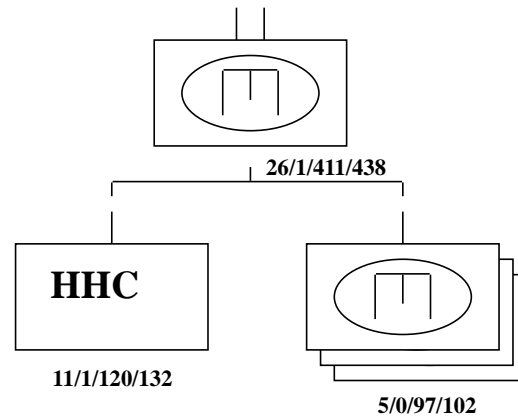
APPENDIX F – Pre-Modularity Divisional Combat Engineer Battalion

ENGINEER TASK ORGANIZATION

EQUIPMENT RECAPITULATION:

3 M577	29 M113	12 AVLB
6 M548	6 VOLCANO	18 JAVELIN
	21 ACE	2 M88
28 HMMWV	12 MICLIC	4 HEMMT POL
1 BATMOBILE	2 MKT	8 HEMMT CGO
6 SEE	3 5T CGO	1 HEMMT WRKR
11 2.5T CGO	3 CONT TRK	6 WTR TRLR

ENGR BN, ENGR BDE, AR DIV



4/8/97

177

129

¹²⁹ “Engineer Task Organization,” (Presentation created by willij16, April 8, 1997). This slide was copied directly from the PowerPoint presentation; the author listed in the properties to the presentation is willij16. Mr. Williams, an instructor at the Command and General Staff College, Fort Leavenworth and second reader to this monograph, provided the copy of the PowerPoint presentation used to create this appendix.

BIBLIOGRAPHY

Books

- Bertalanffy, Ludwig von. *General System Theory*. New York: George Braziller, Inc., 1968.
- Dorner, Dietrich. *The Logic of Failure*. New York: Metropolitan Books, 1996.
- Senge, Peter M. *The Fifth Discipline*. New York: Doubleday, 1990.
- Turabian, Kate L. *A Manual for Writers of Research Papers, Theses, and Dissertations, 7th ed.* Chicago: The University of Chicago Press, 2007.

Periodicals

- Army Logistician. "Army announces stationing decisions." *Army Logistician* (March-April 2008). http://findarticles.com/p/articles/mi_m0PAI/is_2_40/ai_n27943052 (accessed March 31, 2009).
- Eckstein, COL Jeffrey R. "Modular Engineer Structure in Divisions." *Engineer: The Professional Bulletin of Army Engineers*, January - March 2008: 61-63.
- Fowler, Mike. "Engineer Objective Force Concept: "How to Fight"." *Engineer: The Professional Bulletin of Army Engineers*, April-June 2003: 6-8.
- Inbar, Efraim. "How Israel Bungled the Second Lebanon War." *The Middle East Quarterly*, Summer Summer 2007: 57-65.
- Jane's Intelligence Review. "Terrorism & Insurgency." *Janes*. November 1, 2006. <http://www8.janes.com/Search/documentView.do?docId=/content1/janesdata/m> (accessed July 31, 2008).
- Koening, LTC Reinhard W. "Forging Our Future - Using Operation Iraqi Freedom Phase IV Lessons Learned." *Engineer: The Professional Bulletin of Army Engineers*, January-March 2004: 21-22.
- Lefler, LTC Edward R., and Les R. Hell. "Engineer Doctrine Update." *Engineer: The Professional Bulletin of Army Engineers*, January-March 2006: 29-34.
- Martin, COL Gregg F., and CPT David E. Johnson. "Victory Sappers: V Corps Engineers in Operation Iraqi Freedom Part 1: The Attack to Baghdad and Beyond..." *Engineer: The Professional Bulletin of Army Engineers*, July-September 2003: 4-12.
- McCauley, David. "Israeli-Hezbollah conflict of 2006: EBA in joint OPs." *thefreelibrary*. September 1, 2007. <http://www.freelibrary.com/Israeli-Hezbollah+conflict+of+2006%3a+EBA+in=Joint+OPs> (accessed July 21, 2008).
- Miller, Klaude A. "Tony", and David L. Draker. "Combat Support Brigade (Maneuver Enhancement)." *Engineer: The Professional Bulletin of Army Engineers*, January-March 2006: 11-13.
- Mullen, Admiral Michael G. "From the Chairman: What I Have Learned about the Army." *Joint Forces Quarterly, Issue 52*, 2009: 8-9.
- Roberts, Dr. Larry. "The Evolution of the Engineer Force: Part II." *Engineer: The Professional Bulletin of Army Engineers*, 2002: 40-46.

- Skelton, Congressman Ike. "America's Frontier Wars: Lessons for Asymmetric Conflicts." *Military Review*, June 2008: 2-7.
- Toomey, COL Christopher J. "Engineer Expeditionary Force Design Concepts - from Theory to Practice in Task Force Able." *Engineer: The Professional Bulletin of Army Engineers*, April-June 2004: 4-7.
- U.S. Army Maneuver Support Center Training and Doctrine Development Department. "Engineer Doctrine Update." *Engineer: The Professional Bulletin of Army Engineers*, January-March 2008: 34-41.
- Wallace, General William S. "FM 3-0 Operations: The Army's Blueprint." *Military Review*, June 2008: 50-55.
- Watson, LTC Bryan, LTC David Holbrook, MAJ Stephen Bales, MAJ Mollie Pearson, MAJ Brian Slack, and Mike Fowler. "The Future Engineer Force: Projecting the Capabilities of the Regiment." *Engineer: The Professional Bulletin of Army Engineers* (United States Army Engineer School), January - March 2004: 7-15.

Government Documents and Publications

- Casey, GEN George W. Jr. *AUSA - Association of the United States Army*. October 7, 2008. http://www.ausa.org/news/latestnews/NewsArchive_2008/Documents/2008AnnualMeetingCaseyTranscript.pdf (accessed November 4, 2008).
- Derosier, Major Michael C. "Assessing Engineer Transformational Concepts." Student Monograph for Advanced Military Science Program, Fort Leavenworth, 2005.
- Fontenot, COL Gregory, LTC E.J. Degen, and LTC David Tohn. *On Point: The United States Army in Operation Iraqi Freedom*. Fort Leavenworth: Combat Studies Institute Press, 2004.
- Glenn, Russell W. *All Glory is Fleeting: Insights from the Second Lebanon War*. Suffolk: National Defense Research Institute (RAND), February 2008.
- Marich, COL Lou, interview by Dennis Van Wey. *Interview with COL Lou Marich* (April 10, 2006).
- Matthews, Matt M. *We Were Caught Unprepared: The 2006 Hezbollah-Israeli War*. The Long War Series Occasional Paper 26, Fort Leavenworth: Combat Studies Institute Press, 2008.
- O'Hara, Colonel Thomas. *Engineer Support to Future Full-Spectrum Operations*. Strategy Research Project, Carlisle Barracks: U.S. Army War College, 2008.
- Raymer, LTC James, interview by John McCool. *Interview with LTC James Raymer* (February 24, 2006).
- Schultze, Major James M. "Breaching the Phalanx: Developing a More Engineer-Centric Modular BCT." Student Monograph for Advanced Military Science Program, Fort Leavenworth, 2007.
- Task Force Modularity. *Army Comprehensive Guide to Modularity Volume I Version 1.0*. Fort Monroe: Headquarters, US Army Training and Doctrine Command, 2004.
- Tipton, COL Robert. "Engineer Capabilities in Support of the Brigade Combat Team." Fort Leonard Wood: U.S. Army Engineer School, 2007. 30.

- . "The US Army Engineer School (USAES) provides the following information:." *MESSAGE TO THE REGIMENT* #61. December 24, 2008.
<http://www.hqda.army.mil/daen/engineer/MESSAGE%20TO%20THE%20REGIMENT%2061.pdf> (accessed January 12, 2009).
- U.S. Army. *2006 Army Modernization Plan: Building, Equipping & Supporting the Modular Force*. Army Modernization Plan, Washington D.C.: Government Printing Office, 2006.
- . *2007 Army Modernization Plan: Call to Duty Boots on Ground*. Army Modernization Plan, Washington D.C.: Government Printing Office, 2007.
- . *FM 3-0 Operations*. Washington D.C.: Government Printing Office, February 2008.
- . *FM 3-34 (FM 5-100) Engineer Operations*. Washington D.C.: Government Printing Office, 02 January 2004.
- . "FM 7-0 Training For Full Spectrum Operations (December 2008)." *U.S. Army Combined Arms Center*. <http://usacac.army.mil/cac2.FM70.asp> (accessed December 17, 2008).
- . *The United States Army Engineer After Action Review for Operations Desert Shield and Desert Storm*. Fort Leonard Wood: U.S. Army Engineer School, July 1993.
- U.S. Department of Defense. *JP 3-0 Operations*. Washington D.C.: U.S. Government Printing Office, 13 February 2008.
- . *JP 5-0 Joint Operation Planning*. Washington D.C.: U.S. Government Printing Office, 26 December 2006.
- . *National Defense Strategy*. Washington D.C.: U.S. Government Publishing Office, June 2008.
- . *The National Military Strategy of the United States of America*. Washington D.C.: U.S. Government Printing Office, 2004.
- Wilson, COL Roger A. Jr. *Campaign Quality Gap: Developing Strategic Engineering Competency*. Strategy Research Project, Carlisle Barracks: U.S. Army War College, 2007.
- Wright, Dr. Donald, COL Timothy R. Reese, and Contemporary Operations Study Team. *On Point II: Transition to the New Campaign*. Fort Leavenworth: Combat Studies Institute Press, 2008.
- Young, COL Don C., interview by Dennis Van Wey. *Interview with Colonel Don C. Young* (April 10, 2006).

Other

- 20th Engineer Brigade (Combat) (Airborne). *20th Engineer Brigade Homepage*. March 15, 2007.
<http://www.bragg.army.mil/20ENG/default.htm> (accessed January 19, 2009).
- 36th Engineer Brigade. *36th Mission*. <http://www.hood.army.mil/36thengbde/36thMission.html> (accessed January 19, 2009).
- 555th Engineer Brigade. *555th EN BDE Mission Statement & Brigade METL*. June 25, 2008.
<http://www.lewis.army.mil/555/Mission/mission.htm> (accessed January 19, 2009).
- 588th Engineer Battalion. *588th Engineer Battalion (Combat) (Army) Alumni Website: a history ... The Corps of Engineers*. 1997. <http://www.mendonet.com/588th/engrhist.htm> (accessed March 29, 2009).

- End the Occupation: US Campaign to End the Israeli Occupation. Investigate Caterpillar Bulldozer Violations of U.S. Law. November 3, 2003.
<http://www.endtheoccupation.org/article.php?id=251> (accessed March 29, 2009).
- GlobalSecurity.org. *Al-Aqsa Intifada*. August 15, 2006.
<http://www.globalsecurity.org/military/world/war/intifada2.htm> (accessed March 30, 2009).
- MathKnight, and Zachi Evenor. *MathKnight*.
www.geocities.com/israel1mathknight/D9bulldozer.htm (accessed March 30, 2009).
- Niva, Steve. "CounterPunch." *A War Without Balance: Rachel Corrie, Nuha Sweidan and Israeli War Crimes*. March 15, 2003. <http://www.counterpunch.org/niva03172003.html> (accessed March 29, 2009).
- Raymond Willimas and Education + John Howard Whitehouse. "Peter Senge and the Theory and Practice of the Learning Organization." *Infed.org*.
<http://www.infed.org/thinkers/senge.htm> (accessed September 23, 2008).
- Scribd. *Israeli Ground Forces*. <http://www.scribd.com/doc/12354901/Israeli-Ground-Forces> (accessed March 8, 2009).
- U.S. Army Corps of Engineer Los Angeles District Public Affairs Office. *U.S. Army Corps of Engineers Los Angeles District - Homepage*. January 15, 2009.
<http://www.spl.usace.army.mil/cms/index.php> (accessed February 3, 2009).